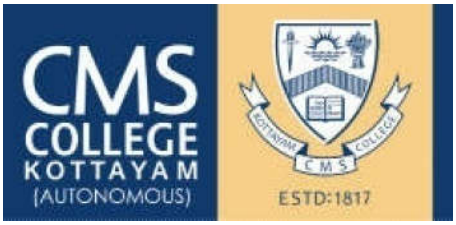

CMS COLLEGE KOTTAYAM

(AUTONOMOUS)

Affiliated to the Mahatma Gandhi University, Kottayam, Kerala

CURRICULUM FOR
UNDER GRADUATE PROGRAMME

BACHELOR OF COMPUTER APPLICATION
(BCA)

UNDER CHOICE BASED CREDIT SYSTEM 2018
(With effect from 2018)

Approved by the Board of Studies on 8-3-2018

CONTENTS

ACKNOWLEDGEMENT

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We place on record our thanks to the various members of the board of studies board below.

1. Dr.Wilscy M, Chairperson, (Head of the Department of Computer Science & Dean, Saintgits College of Engineering, Kottayam)
2. Dr. R. VIJAYAKUMAR ,Professor (Director in Charge). Department: School of Computer Science, Mahatma Gandhi University, Kottayam
3. DR. KANNAN B , Associate Professor , Department of Computer Applications
4. Dr. Shine N Das, Associate Professor. Department, of Computer Science & Engg Government Engineering College, Munnar.
5. Prof. Koshy Varghese, Vice-Principal, Saintgits College of Engineering, Kottayam)
6. Dr. John T. Abraham, Head of the Department of Computer Science, Bharat Matha College, Thrikkakara.
7. Dr. Ramani Bai V, Department of Computer Science and Engineering, Saintgits College of Engineering
8. Prof. Mathew C. Mathew, Head of the Department of Computer Science, CMS College, Kottayam (Co-ordinator)

PREFACE

Technology is defined as the applications of Basic Science. The past two revolutions, industrial and electronic, have transformed the society from agricultural to industrial and then to electronic. The electronically based technologies focused in information gathering, processing and distribution. The use of this technology in all sectors gave the birth to Computer Industry and its unprecedented growth launched another revolution in Communication.

Information, the basic raw material for the Decision Support System, can be derived from processing of huge database related with different sectors. Systematic storage and management with adequate security are essential for data retrieval and processing to generate information. The information technology plays an important role in all areas. But the main drawback is the technophobia of the people to adapt with the new technologies. This may be due to lack of awareness of the merits and advantages of new technologies. So our youths have to be equipped with all kinds of knowledge tools to work with computers comfortably which are basic requirements to provide human resource to the industry.

The radical changes in technologies, both hardware as well as software, and their ever increasing adaptation to newer areas of application, demand frequent updating of the academic curriculum so that the students can rise to the expectation of the Industry. The syllabus revision committee has considered all these factors thoroughly before venturing into the revision exercise.

The revised syllabus for BCA Programme provides a strong foundation to pursue higher studies in computer science/applications. Special emphasis is given in such a way that students may also equip themselves as Application Developers to meet the industrial needs in Local, National and Global contexts.

The BCA Programme of the CMS College (Autonomous) follows the choice based credit semester system as envisaged by the University Grants Commission and the Higher Education Council of Kerala. The Programme shall be completed in six semesters. Each semester is a minimum of 18 instructional weeks, comprising 90 working days with continuous internal evaluation and End Semester examination at the end of each semester.

CURRICULUM

GRADUATE PROGRAMME OUTCOMES (GPO)

At the completion of the Undergraduate Programme, the student will be able to accomplish the following outcomes:

GPO No.	Graduate Programme Outcomes
GPO.1	**Critical Thinking**: Take an informed and analytical approach to learning and demonstrate in-depth knowledge of the subject and give opinion(s) supported by logical reasoning that one have judged to be appropriate and understanding different approaches and using them
GPO.2	**Effective Communication:** Demonstrate proficiency in communicating competently in groups and organizations, competence in interpersonal communication; possess skills to effectively deliver formal and informal presentations to a variety of audiences in multiple contexts
GPO.3	**Social Interaction:** Foster social skills and peer interaction enabling them to make all people feel valued and respect their differences by being responsible citizens for creating a socially inclusive society
GPO.4	**Ethical Standards:** Recognize values such as justice, trust, equity, fairness, kindness and develop a commitment to meeting and upholding standards of ethical behavior in all walks of life and comprehending the moral dimensions of decisions and actions
GPO.5	**Environmental Consciousness:** Discern the issues of environmental contexts and engages in promoting values and attitudes that claim coexistence and sustainable living with reduced, minimal, or no harm upon ecosystems
GPO.6	**Lifelong Learning:** Acquire the skill to be an independent lifelong learner embracing real-time changes in the socio-technological context, promoting continuous development and improvement of the knowledge and skills needed for employment and personal fulfillment

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO No.	***Intended Programme Specific Outcomes*** ***Upon completion of Bachelor of Computer Applications Programme, the graduates will be able to:***	***GPO No.***
PSO-1	**A**pply knowledge of mathematics, management, logic and allied engineering subjects as applicable to Computer Science and Engineering	1
PSO-2	**U**nderstand how to identify, formulate and design solutions in the areas of Computer Science and Engineering	**1**
PSO-3	**D**emonstrate the abilities to design and develop algorithms and implement them as programs, with analysis and interpretation of data	**1**
PSO-4	**D**evelop skills in software development so as to enable the graduates to take up employment/self-employment in local, Indian & global software market	**1**
PSO-5	**A**ddress the challenges of complex and computation intensive problems	**1,2**
PSO-6	**L**earn theoretical foundations of different branches of Computer Science so that students can pursue for higher studies	**1**
PSO-7	**A**dopt any modern engineering tool or software for analyzing and solving various computer engineering problems	**1,2**
PSO-8	**H**ave the knowledge of contemporary issues and able to apply various software engineering approaches for project management	**1,2,3**
PSO-9	**U**nderstand the impact of professional engineering solutions in environmental contexts and the need for sustainable development.	**1,2,3**
PSO-10	**T**ackle the real life problems using the internationally accepted latest technologies	**1,3**
PSO-11	**C**ommunicate effectively on complex programming activities with the IT community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	**1,3,5**
PSO-12	**E**nhance Employability by developing leadership, effective communication & time management skills and also by incorporating ethics & team work ability	**3-6**
PSO-LG	**O**rganize and deliver relevant applications of knowledge through effective written verbal, graphical/ virtual communication and interact productively with people from diverse background.	**3**

PROGRAMME DESIGN

BCA PROGRAMME

The Under Graduate programme in Computer Application includes compulsory core courses, complementary courses, Open Course, elective course, project work, Common course-English. For the successful completion of this UG programme, a student shall acquire minimum 120 credits. Provision has also been made for acquiring Extra credits through the Add on courses. The course design is given below.

Sl. No.	Course type	No. of courses	Total credits
1	Common course I-English	2	8
2	Core	18	67
3	Core Practical	6	12
4	Complementary I	3	12
5	Complementary II	2	8
6	Open course	1	3
7	Choice Based Course - Elective	1	4
8	Project work	2	5
9	Viva	1	1
Total		**36**	**120**

PROGRAMME STRUCTURE – BCA
(Category wise)

COMMON COURSES

Course Code	Title of the Course	Course Category	Hours/ week	Total hours	Credits
SEMESTER I					
EN1811501	Fine-tune Your English	Common I – English 1	5	90	4
CA1811101	Computer Fundamentals and Digital Principles	Core 1	4	72	4
CA1811102	Methodology of Programming and C Language	Core 2	4	72	3
CA1811601	Software Lab I	Core Practical 1	4	72	2
MT1811202	Discrete Mathematics –I	Complementary I –Mathematics 1	4	72	4
ST1811202	Basic Statistics and Introductory Probability Theory	Complementary II Statistics 1	4	72	4
		Total	**25**	**450**	**21**
SEMESTER II					
EN1812503	Issues that Matter	Common I – English-2	5	90	4
CA1812103	Data Base Management Systems	Core 3	4	72	3
CA1812104	Computer Organization and Architecture	Core 4	4	72	4
CA1812105	Object oriented programming using C++	Core 5	3	54	4
CA1812602	Software Lab- II	Core Practical 2	5	90	2
MT1812204	Discrete Mathematics- II	Complementary I –Mathematics 2	4	72	4
		Total	**25**	**450**	**21**

SEMESTER III					
CA1813106	Computer Graphics	Core 6	4	72	4
CA1813107	Microprocessor and PC Hardware	Core 7	3	54	4
CA1813108	Operating Systems	Core 8	4	72	4
CA1813109	Data Structure using C++	Core 9	4	72	3
CA1813603	Software Lab III	Core Practical 3	6	108	2
ST1812204	Advanced Statistical Methods	Complementary II Statistics 2	4	72	4
		Total	**25**	**450**	**21**
SEMESTER IV					
CA1814110	Design and Analysis of Algorithms	Core 10	4	72	4
CA1814111	System Analysis & Software Engineering	Core 11	4	72	4
CA1814112	Linux Administration	Core 12	4	72	4
CA1814113	Web Programming using PHP	Core 13	3	54	3
CA1814604	Software Lab IV	Core Practical 4	6	108	2
MT1814207	Operational Research	Complementary I –Mathematics 3	4	72	4
		Total	**25**	**450**	**21**
SEMESTER V					
CA1815114	Computer Networks	Core 14	3	54	4
CA1815115	IT, Environment and Human Rights	Core 15	4	72	4
CA1815116	Java Programming using Linux	Core 16	3	54	3
CA1815401	Computer Fundamentals, Internet & MS Office	Open Course	4	72	3
CA1815605	Software Lab V	Core Practical 5	5	90	2
CA1815801	Software Development Lab I (Mini Project)	Project work 1	6	108	2
		Total	**25**	**450**	**18**

SEMESTER VI					
CA1816117	Cloud Computing	Core 17	4	72	4
CA1816118	Mobile Application development-Android	Core 18	4	72	4
CA1816606	Software Lab VI & Seminar	Core Practical 6	6	108	2
CA1816802	Software Development Lab II (Main Project)	Project work 2	7	126	3
CA1816301	Data Mining	Elective	4	72	4
CA1816901	Viva Voce	Viva	-		1
		Total	**25**	**450**	**18**

CORE COURSES

Sl.No	Course Name	Credit	Hrs/W	Semester
1	Computer Fundamentals and Digital Principles	4	4	I
2	Methodology of Programming and C Language	3	4	1
3	Data Base Management Systems	3	4	II
4	Computer Organization and Architecture	4	4	II
5	Object oriented programming using C++	4	3	II
6	Computer Graphics	4	4	III
7	Microprocessor and PC Hardware	4	3	III
8	Operating System	4	4	III
9	Data Structures using C++	3	4	III
10	Design and Analysis of Algorithms	4	4	IV
11	System Analysis & Software Engineering	4	4	IV
12	Linux Administration	4	4	IV
13	Web Programming Using PHP	3	3	IV
14	Computer Networks	4	3	V
15	IT, Environment and Human Rights	4	4	V
16	Java Programming using Linux	3	3	V
17	Software Development Lab –I (Mini Project)	2	6	V
18	Cloud Computing	4	4	VI
19	Mobile Application Development – Android	4	4	VI
21	Software Development Lab II (Main Project)	3	7	VI
22	VIVA VOCE	1	-	VI
Total		**67**	80	

CORE PRACTICAL COURSES

Sl.No	Course Name	Credit	Hrs/W	Semester
1	Software Lab I	2	2	1
2	Software Lab II	2	2	2
3	Software Lab III	2	2	3
4	Software Lab IV	2	2	4
5	Software Lab V	2	2	5
6	Software Lab VI & Seminar	2	2	5
Total		**12**		

COMPLEMENTARY COURSES

Sl.No	Course Name	Credit	Hrs/W	Semester
1	Discrete Mathematics –I	4	4	I
2	Basic Statistics and Introductory Probability Theory	4	4	I
3	Discrete Mathematics- II	4	4	II
4	Advanced Statistical Methods	4	4	III
5	Operational Research	4	4	IV
Total		**20**	**20**	

OPEN COURSE - CHOICE BASED

Sl.No	Course Name	Credit	Hrs/Wk	Semester
1	Computer Fundamentals, Internet & MS Office	**3**	4	V
	Total	3	4	

CHOICE BASED COURSE (ELECTIVE)

Sl.No	Course Name	Credit	Hrs/Wk	Semester
1	Data Mining	4	4	6

COMMON COURSE

Sl.No	Course Name	Credit	Hrs/Wk	Semester
1	English I- Fine-tune Your English	**4**	5	I
2	English II - Issues that matter	**4**	5	II

ADD ON COURSES

Sl.No	Course Name
1	Cyber Security
2	Dot-Net Applications
3	Programming with Python

DETAILED SYLLABUS OF THE COURSES OFFERED BY THE DEPARTMENT

SEMESTER I

Course Code	Title of the Course	Course Category	Hours/ week	Total hours	Credits
EN1811501	Fine-tune Your English	Common I – English 1	5	90	4
CA1811101	Computer Fundamentals and Digital Principles	Core 1	4	72	4
CA1811102	Methodology of Programming and Language	Core 2	4	72	3
CA1811601	Software Lab I	Core Practical 1	4	72	2
MT1811202	Discrete Mathematics –I	Complementary I –Mathematics 1	4	72	4
ST1811202	Basic Statistics and Introductory Probability Theory	Complementary II Statistics 1	4	72	4
		Total	**25**	**450**	**21**

Course	Details				
Code	**CA1811101**				
Title	**Computer Fundamentals and Digital Principles**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**First semester**				
Type	**Core**				
Credits	**4**	Hrs/Week	**4 hours**	Total Hours	**72**

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Bridge the fundamental concepts of computers with the present level of knowledge of the students.	R	1,3
2	Familiarise operating systems, programming languages, peripheral devices, networking, multimedia and internet	U	1,3
3	Understand binary, hexadecimal and octal number systems and their arithmetic.	U	1,2
4	Understand how logic circuits and Boolean algebra forms as the basics of digital computer.	U	1,2
5	Demonstrate the building up of Sequential and combinational logic from basic gates.	Ap	1,2
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Introduction**	12	
1.1	Functional units of a computer system	1	1
1.2	Different types of computers	2	1
1.3	Computer Software and Hardware	1	1
1.4	Types of software-System software	1	1
1.5	Application program	1	1
1.6	Characteristic of computers	1	1
1.7	Input Devices – Keyboard, Mouse	2	1
1.8	Optical input devices	1	1
1.9	Output devices – Monitors	1	1
1.10	Printers	2	1
2.0	**Introduction to Operating Systems and Networking**	**10**	

2.1	Definition of an Operating System	1	2
2.2	Different types of PC Operating Systems	2	2
2.3	Computer Networks	1	2
2.4	categories of networks LAN,	1	2
2.5	WAN	1	2
2.6	MAN	1	2
2.7	The Internet	1	2
2.8	Working of Internet	1	2
2.9	Major Features of Internet	1	2
3.0	**Number Systems**	**12**	
3.1	Base or radix; Positional number system	1	3
3.2	Popular number systems – Decimal, Binary	1	3
3.3	Number systems - Octal and Hexadecimal	1	3
3.4	Conversion-From one number system to another	2	3
3.5	Concept of binary addition	1	3
3.6	Concept of subtraction	1	3
3.7	Complements in binary number systems-1sComplement2s Complement	1	3
3.8	Applications of Complements	1	3
3.9	Signed magnitude form	1	3
3.10	BCD numbers – concept	1	3
3.11	BCD numbers – addition	1	3
4.0	**Boolean Algebra and Gate Networks**	**20**	
4.1	Logic gates- AND, OR - Truth tables and graphical representation	1	4
4.2	Logic gates- NOT, NAND and NOR Truth tables and graphical representation	1	4
4.3	Basic laws of Boolean Algebra	2	4
4.4	Simplification of Expressions	2	4
4.5	De Morgans theorems	1	4
4.6	Dual expressions	1	4
4.7	Canonical expressions	1	4
4.8	Min terms	1	4
4.9	Max terms	1	4
4.10	SOP expressions	1	4
4.11	POS expressions	1	4
4.12	Simplification of expression using K-MAP (up to 4 variables)	2	4
4.13	expressions using NAND/NOR Gates	2	4
4.14	Don‘t care conditions	1	4
4.15	XOR and its applications,	1	4
4.16	Parity generator and checker.	1	4
5.0	**Sequential and Combinational Logic**	**18**	
5.1	Flip flops- Latch	1	5
5.2	Flip flops- Clocked, RS	1	5
5.3	Flip flops - JK, T, D	1	5

5.4	Flip flops - Master slave	2	5
5.5	Adders-Half adder	1	5
5.6	Full adder (need and circuit diagram)	1	5
5.7	Encoders	1	5
5.8	Decodes	2	5
5.9	Multiplexers (working of each with diagram)	2	5
5.10	De-multiplexers (working of each with diagram)	1	5
5.11	Analog to digital converters (Diagram and working principle),	2	5
5.12	digital to analog converters (Diagram and working principle)	1	5
5.15	Concept of Registers	1	5
5.14	Shift Registers	1	5

Text Books for Reference

1. Peter Nortons- Introduction to Computers, Sixth Edition, Published by Tata McGraw Hill
2. P K Sinha&PritiSinha - Computer Fundamentals , Fourth Edition, BPB Publications.
3. M Morris Mano-Digital Logic and Computer design, Fourth Edition, Prentice Hall.

Text Books for Enrichment

1. Thomas C Bartee- Digital computer Fundamentals, Sixth Edition, TATA McGraw Hill Edition
2. Thomas L Floyd- Digital Fundamentals, Ninth edition, PEARSON Prentice Hall.
3. Malvino& Leach- Digital Principles and Applications, Sixth Edition, Tata McGraw Hill, 2006

Course	Details				
Code	**CA1811102**				
Title	**Methodology of Programming and C Language**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**First semester**				
Type	**Core**				
Credits	**3**	Hrs/Week	**4 hours**	Total Hours	**72**

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Understand the concepts of programming and methodologies essential for developing good C programs.	U	1,3,4
2	Understand the use of character set, data types and operators	U	1,3,4
3	Apply Flow control statements in problem solving	Ap	1,3,4
4	Apply Complex data types arrays, structures, union and pointers in program development	Ap	1,3,4
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO. No.
1.0	**Introductionto programming.**	**12**	
1.1	Introduction	1	1
1.2	Classification of computer languages	1	1
1.3	Language translators (Assembler, Compiler, Interpreter),	1	1
1.4	Linker	1	1
1.5	Characteristics of a good programming language	1	1
1.6	Factors for selecting a language	1	1
1.7	Subprogram, Purpose of program planning	1	1
1.8	Algorithm, Flowchart	1	1
1.9	Pseudocode	1	1
1.10	Control structures -sequence, selection.	1	1
1.11	Control structures – Iteration	1	1
1.12	Testing and debugging	1	1
2.0	**C Character Set, Data types and Operators**	**12**	

2.1	Character Set, Delimiters	1	2
2.2	Types of Tokens, C Keywords	1	2
2.3	Identifiers, Constants	1	2
2.4	Variables, Rules for defining variables	1	2
2.5	Data types, Declaring and initialization of variables	1	2
2.6	Type modifiers, conversion	1	2
2.7	Operators and Expressions- Properties of operators	1	2
2.8	Priority of operators, Comma and conditional operator	1	2
2.9	Arithmetic operators, Relational operators.	1	2
2.10	Assignment operators and expressions.	1	2
2.11	Logical Operators.	1	2
2.12	Bitwise operators.	1	2
3.0	**Input and Output in C, Decision Statements & Loop control.**	**15**	
3.1	Formatted functions	1	3
3.2	unformatted functions	1	3
3.3	library functions	1	3
3.4	Introduction to Decision Statements.	1	3
3.5	Decision Statements- If	1	3
3.6	Decision Statements- if-else	1	3
3.7	Decision Statements- if-else-if ladder	1	3
3.8	Decision Statements- nested if-else	1	3
3.9	Decision Statements- break, continue, goto	1	3
3.10	switch, nested switch	1	3
3.11	Introduction to Loop control- for loops	1	3
3.12	for loops	1	3
3.13	nested for loops	1	3
3.14	while loops	1	3
3.15	do while loop	1	3
4.0	**Array, Strings and Pointers.**	**15**	
4.1	Introduction of Array and Array initialization.	1	3
4.2	Characteristics of an array.	1	3
4.3	One dimensional array.	1	3
4.4	Operations to one dimensional array.	1	3
4.5	Two dimensional arrays.	1	3
4.6	Operations to two dimensional array.	1	3
4.7	Strings and standard functions.	1	3
4.8	Recognize Pointers.	1	3
4.9	Features of Pointers.	1	3
4.10	Pointer and address.	1	3
4.11	Pointer declaration,	1	3
4.12	Void wild constant pointers.	1	3
4.13	Arithmetic operations with pointers	1	3
4.14	Pointer and arrays.	1	3
4.15	Pointers and two dimensional arrays.	1	3

5.0	**Basics of a function, recursion and structures**	**15**	
5.1	Basics of function , definition and return	1	4
5.2	Types of functions- call by value and reference.	1	4
5.3	Recursion-Types of recursion	1	4
5.4	Rules for recursive function	1	4
5.5	direct and indirect recursion	1	4
5.6	Recursion vs. iterations, Advantages and disadvantages of recursion	1	4
5.7	Storage class	1	4
5.8	Structure and union	2	4
5.9	Features of structures	1	4
5.10	Declaration and initialization of structures	1	4
5.11	array of structures	1	4
5.12	Pointer to structure	1	4
5.13	Structure and functions.	1	4
5.14	typedef , bitfields	1	4
5.15	Enumerated data types, Union.	1	4
5.16	Dynamic memory allocation, Memory models	1	4
5.17	Dynamic Memory allocation functions	1	4

Text Books for Reference

1. Ashok Kamthane - Programming in C, Third Edition, Pearson Education
2. P K Sinha&PritiSinha - Computer Fundamentals , Fourth Edition, BPB Publications

Text Books for Enrichment

1. E. Balaguruswamy -Programming in ANSI C ,Seventh Edition , McGraw Hill Education
2. Byron Gotfried - Programming with C, Second Edition, Schaums Outline series. McGraw Hill

Course	Details				
Code	**CA1811601**				
Title	**Software Lab I**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**First semester**				
Type	**Core Practical**				
Credits	**2**	Hrs/Week	**4 hours**	Total Hours	**72**

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Use the fundamentals of C programming in trivial problem solving	u	1-3
2	Choose the loops and decision making statements to solve problems.	Ap	1-3
4	Demonstrate the use of Strings and string handling functions.	Ap	1-3
5	Understand the significance of pointers	U	1-3
6	Use functions to solve problems.	U	1-3
7	Understand structures and unions.	U	1-3
8	Distinguish the strategy of dynamic memory allocation.	U	1-3
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Basic Level C Programs**	27	
1.1	Programs to familiarize printf() and scanf() functions.	2	1
1.2	Programs based on Decision statements.	3	2
1.3	Programs based on break, goto.	2	2
1.4	Programs based on continue and switch.	3	2
1.5	Programs using Loop controls statements.	5	2
1.6	Programs Based on One dimensional arrays	4	3
1.7	Programs Based on two dimensional arrays.	4	3
1.7	Programs on Strings and string handling functions	4	4
2.0	**Pointer Operations**		

2.1	Programs based on Pointers.	4	5
2.2	Operations on pointers.	3	5
2.3	Arrays & Pointers.	5	5
3.0	**Programs based on functions.**		
3.1	Functions- Call by value	5	6
3.2	Functions- Call by reference	5	6
3.3	Recursion function	3	6
4.0	**Structures and Union**		
4.1	Programs based on Structures	3	7
4.2	Programs based on Union	4	7
4.3	Array of structures	3	7
4.4	Pointer to structure.	4	7
4.5	Structure and functions	3	7
5.0	**Memory allocation**		
5.1	Simple programs using pointers andmalloc().	3	8

Text Books for Reference

1. E. Balaguruswamy -Programming in ANSI C ,Seventh Edition , McGraw Hill Education

Text Books for Enrichment

2. Byron Gotfried - Programming with C, Second Edition, Schaums Outline series. McGraw Hill

Scheme of Evaluation for software lab I external is as follows:

Division of Marks (Practical - 3 hours External)

First program from part 1& 2			**- 25 marks**
1.Flowchart	-	5 marks	
2.Logic	– 10 marks		
3.Successful compilation	– 5 marks		
4.Result	–	5 marks	
Second program should be based on advanced concepts ,part 3 to part 8			**- 35 marks**
1.Logic	– 20 marks		
2.Successful compilation	– 10 marks		
3. Result	– 5 marks)		
Viva Voce			**- 10 marks**
Lab Record (minimum of 25 Programs)			**- 10 marks**
Total Marks			**- 80 marks**

Course	Details				
Code	**ST1811202**				
Title	**Basic Statistics and Introductory Probability Theory**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**First semester**				
Type	**Complementary**				
Credits	**4**	Hrs/Week	**4 hours**	Total Hours	**72**

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Identify and demonstrate appropriate sampling and data collection process.	R,U	1
2	Understand how to classify and tabulate data	R,U	1
3	Define, illustrate and apply the concept of probability and conditional probability.	R, Ap	1
4	Define, illustrate and apply the concept of discrete and continuous random variable.	R, Ap	1
5	Define, illustrate and apply the concept of discrete and continuous random variable.	R,U	1
6	Using the concept expectation to find mean and variance.	Ap	1
7	Apply the concept of fitting to fit different curves.	U, Ap	1
8	Perform a regression analysis and compute the coefficient of correlation.	Ap	1
9	Explain measures of central tendency, dispersion and partition values.	U, Ap	1
10	Solve the problems using what they studied	Ap	1
11	To understand how to represent complex data using graphs.	Ap	1
12	Compute probabilities of certain events using multiplication rule.	Ap	1
13	Calculate probabilities using Bayes' theorem and the law of total probability.	U,Ap	1
14	Calculate probability mass functions for discrete random variables.	U,Ap	1
15	Define parameters of different probability density function.	U,R	1
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.NO
	BRIDGE COURSE (this topic is for internal evaluation only. Quick review and give internal assessment from this topics. Not included in the external examination) Introduction to Statistics, Population and Sample, Collection of Data, Census and Sampling, Methods of Sampling Simple Random Sampling (with and without replacement) stratified sampling systematic sampling (Method only), Types of data quantitative, qualitative, Classification and Tabulation, Diagrammatic representation - Bar diagram, Pie diagram. Frequency polygon; frequency curve; ogives and stem and leaf chart.	**7**	1,2
1.0	**Graphical representation**	**19**	
1.1	Measures of Central Tendency -Mean, Median, Mode	8	9, 10
1.2	Partition values-quartiles, Percentiles, Deciles.	4	9,10
1.3	Measures of Dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Variation	7	9,10
2.0	**Introduction to bivariate data**	**10**	
2.1	Scatter Diagram	2	7, 10
2.2	Correlation-evaluation of correlation coefficient, linear correlation covariance method (formula only) and simple problems.	4	7,10
2.3	Regression- Curve Fitting by the Method of Least Squares (without proof), Regression equations, identification of regression lines and properties. Fitting of straight line, exponential curve, power curve,	4	7, 10
3.0	**Probability Concepts**	**19**	
3.1	Random Experiment, Sample Space, Events, Probability Measure	4	4

3.2	Approaches to Probability- Classical, Statistical and Axiomatic	3	3,10
3.3	Addition Theorem (up to 3 events)	2	3,10
3.4	Conditional Probability	3	3,10
3.5	Independence of events, Multiplication theorem (up to 3 events), Total probability law	3	10,12
3.6	Bayes Theorem and its applications	4	10,13
4.0	**Random variables and distribution functions**	**17**	
4.1	Random variables ,Probability density (mass) function	3	5,10,14
4.2	Distribution function- properties	4	5,10,14
4.3	Expectation of a discrete and continuous random variables-properties (without proof)	4	10,15
4.4	Mean and standard deviation of different probability density function(without proof)	3	6,10,15
4.5	Moment generating function, important properties (without proof)	3	10,15

Text Books for Reference

1. S.P Gupta: Statistical Methods.

2. S.C Gupta and V.K Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons

3. B.L Agarwal: Basic Statistics, New Age International (p) Ltd

SEMESTER II

Course Code	Title of the Course	Course Category	Hours/ week	Credits
EN1812503	Issues that Matter	Common I – English-2	5	4
CA1812103	Data Base Management Systems	Core 3	4	3
CA1812104	Computer Organization and Architecture	Core 4	4	4
CA1812105	Object oriented programming using C++	Core 5	3	4
CA1812602	Software Lab- II	Core Practical 2	5	2
MT1812204	Discrete Mathematics- II	Complementary I –Mathematics 2	4	4
		Total	**25**	**21**

Course	Details				
Code	**CA1812103**				
Title	**Data Base Management Systems**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Second semester**				
Type	**Core**				
Credits	**3**	Hrs/Week	**4 hours**	Total Hours	**72**

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Characterise the data base approach	U	2,4
2	Discuss the relations, relationship models and relational database schemas in detail	U	2,4
3	Practice with the SQL queries	Ap	2,4
4	Understand the Normalization and Indexing Structures for Files	U	2,4
5	DiscussTransaction Processing and Database Security	U	2,4
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Introduction**	**12**	
1.1	Characteristics of the Database Approach	1	1
1.2	Database users :DBA	1	1
1.3	Database users: Database Designers	1	1
1.4	Database users: End users	1	1
1.5	Advantages of using the DBMS Approach	1	1
1.6	Data models, Schemas , and Instances	2	1
1.7	Three-Schema Architecture and Data Independence	2	1
1.8	DBMS Languages: DDL, DML	1	1
1.9	The Database System Environment	1	1
1.10	DBMS Component Modules.	1	1
2.0	**Unit 2: Relational Model**	**16**	
2.1	Entity Relationship Modeling: Introduction	1	2

2.2	Entity Types , Entity Sets , Attributes and Keys	1	2
2.3	Relationship Types	1	2
2.4	Relationship Sets, Roles	1	2
2.5	Structural Constraints	1	2
2.6	Weak Entity Types	1	2
2.7	Notation for ER diagrams – Sample ER diagrams	1	2
2.8	Relational Model concepts	1	2
2.9	Domains ,Attributes, Tuples, and Relations	1	2
2.10	Characteristics of Relations	1	2
2.11	Relational Model Constraints	1	2
2.12	Relational Database Schemas	1	2
2.13	Domain Constraints, Key Constraints	1	2
2.14	Relational Database Schemas	1	2
2.15	Entity Integrity	1	2
2.16	Referential Integrity, and Foreign Keys .	1	2
3.0	**SQL**	**14**	
3.1	Data Types	1	3
3.2	Data Definition commands : CREATE , ALTER ,DROP	1	3
3.3	Adding constraints in SQL	1	3
3.4	Basic SQL Queries : INSERT ,SELECT, DELETE ,UPDATE	1	3
3.5	Substring comparison using LIKE operator,BETWEEN operator	1	3
3.6	Ordering of rows	1	3
3.7	SQL set operations UNION, EXCEPT, INTERSECT	1	3
3.8	Complex Queries	1	3
3.9	Comparison involving NULL and Three-valued logic	1	3
3.10	Nested queries	1	3
3.11	EXISTS and UNIQUE functions	1	3
3.12	Renaming of attributes	1	3
3.13	Joining of tables, Aggregate functions ,Grouping	1	3
3.14	Managing Views.	1	3
4.0	**Normalization and Indexing Structures for Files**	**15**	
4.1	Normalization	1	4
4.2	Informal Design Guidelines for Relational Schemas	2	4
4.3	Functional Dependencies	1	4
4.4	Normal forms : First Normal Form	1	4
4.5	Second Normal Form	1	4
4.6	Third Normal Form	1	4
4.7	BCNF.	2	4
4.8	Indexing Structures for files	1	4
4.9	Types of Single-Level Ordered Indexes	2	4
4.10	Primary Indexes	1	4
4.11	Clustering Indexes,	1	4
4.12	Secondary Indexes.	1	4
5.0	**Transaction Processing and Database Security**	**15**	

5.1	Transaction Processing -Introduction to Transaction Processing	2	5
5.2	Transaction and System Concepts	1	5
5.3	Desirable properties of Transactions	1	5
5.4	Database Security and Authorization	2	5
5.5	Types of Security	1	5
5.6	Control measures	1	5
5.7	Database Security and DBA	2	5
5.8	Access Control	1	5
5.9	User Accounts	1	5
5.10	Database Audits	1	5
5.11	Access Control based on Granting and Revoking Privileges	2	5

Text Books for Reference

1. RamezElmasri and ShamkantB.Bavathe - DATABASE SYSTEMS , Sixth Edition, Pearson Education.

Text Books for Enrichment

1. C.J Date- An Introduction to Database Systems, Eighth edition, Pearson Education,2003
2. ReghuRamakrishnan and Johannes Gehrke- Database Management Systems , Third edition, McGraw Hill International Edition.
3. DipinDesai , An Introduction to Database Systems , First Edition, Galgoria Publications .

Course	Details				
Code	**CA1812104**				
Title	**Computer Organization and Architecture**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Second semester**				
Type	**Core**				
Credits	**4**	Hrs/Week	**4 hours**	Total Hours	**72**

CO No.	*Expected Course Outcomes* *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	**Describe the fundamental organisation of a computer system**	**U**	**6**
2	**Explain the functional units of a processor**	**U**	**6**
3	**Explain addressing modes, instruction formats and program control statements**	**U**	**2,6**
4	**Distinguish the organization of various parts of a system memory hierarchy**	**U**	**2,6**
5	**Describe basic concept of parallel computing**	**U**	**2,6**
6	**Describe fundamentals concepts of pipeline and vector processing**	**U**	**2,6**
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Basic computer organization and design**	12	
1.1	Operational concepts	2	1
1.2	Instruction codes	1	1
1.3	Computer Registers	1	1
1.4	Computer Instructions	1	1
1.5	Memory locations	1	1
1.6	Memory Addresses	1	1
1.7	Instruction cycle	2	1
1.8	Timing Signals	1	1
1.9	Control Signals	1	1
1.10	Bus organization.	1	1
2.0	**Central Processing Unit**	**15**	

2.1	General Register Organization	3	2
2.2	Stack Organization	2	2
2.3	Addressing modes	4	3
2.4	Instruction Classification	3	3
2.5	Program control.	3	3
3.0	**Memory Organization**	**16**	
3.1	Memory Hierarchy	1	4
3.2	Main Memory	1	4
3.3	Organization of RAM	2	4
3.4	SRAM	1	4
3.5	DRAM	1	4
3.6	Read Only Memory	1	4
3.7	PROM	1	4
3.8	EROM	1	4
3.9	EEPROM	1	4
3.10	Auxiliary memory	1	4
3.11	Cache memory,	1	4
3.12	Virtual Memory	1	4
3.13	Memory mapping Techniques.	3	4
4.0	**Parallel Computer Structures**	**15**	
4.1	Introduction to parallel processing	2	5
4.2	Pipeline computers	3	5
4.3	Multi processing systems	2	5
4.4	Architectural classification scheme-SISD	2	5
4.5	Architectural classification scheme- SIMD	2	5
4.6	Architectural classification scheme- MISD	2	5
4.7	Architectural classification scheme- MIMD	2	5
5.0	**Pipelining and Vector processing**	**14**	
5.1	Introduction to pipelining	3	6
5.2	Instruction and Arithmetic pipelines (design)	3	6
5.3	Vector processing	4	6
5.4	Array Processors	4	6

Text Books for Reference

1. M.Morris Mano-Computer Systems Architecture, Third Edition, Pearson Education
2. Kai Hwang and F A Briggs-Computer Architecture and parallel processing, McGraw Hills,1990

Text Books for Enrichment

1. Carl Hamacher -Computer Organization, Fifth Edition, Tata McGraw Hill.
2. John P Hayes -Computer Architecture & Organization–McGraw Hill
3. William Stallings-Computer Organization and Architecture , Seventh Edition, Pearson Education

Course	Details				
Code	**CA1812105**				
Title	**Object Oriented Programming using C++**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Second semester**				
Type	**Core**				
Credits	**4**	Hrs/Week	**3 hours**	Total Hours	**54**

CO No.	*Expected Course Outcomes* *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	**Understand the difference between the top-down and bottom-up approach**	**U**	**2,3**
2	**Describe the object-oriented programming approach in connection with C++**	**U**	**2,5**
3	**Apply the concepts of object-oriented programming**	**Ap**	**2,3**
4	**Illustrate the process of data file manipulations using C++**	**Ap**	**2,3**
5	**Apply virtual and pure virtual function & complex programming situations**	**Ap**	**1-4**
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Principles of Object Oriented Programming, Beginning with C++**	10	
1.1	Basic concepts of procedure-oriented and object-orientedprogramming	1	1
1.2	Benefits and Applications of OOP	1	1
1.3	Structure of C++ program with simple C++ program	1	2
1.4	C++ data types, Symbolic constants and Reference by variables	1	2
1.5	Operators in C++ and Operator precedence	1	2
1.6	Control structures	1	2
1.7	Function in C++ , the main function, Function prototyping	1	2
1.8	Call by reference & Return by reference	1	2
1.9	Inline function & Default arguments	1	2

1.10	Function overloading	1	2
2.0	**Classes and Objects**	**10**	
2.1	Specifying a class- Defining member functions	1	3
2.2	Private member functions & Nesting of member functions	1	3
2.3	Arrays within a class	1	3
2.4	Memory allocation for objects	1	3
2.5	Static data members & Static member functions	2	3
2.6	Arrays of objects	1	3
2.7	Objects as function arguments	1	3
2.8	Friendly functions	1	3
2.9	Returning Objects	1	3
3.0	**Constructers and Destructors, Overloading**	**12**	
3.1	Constructors	1	3
3.2	Default constructor, Parameterized constructor &Copy constructor	2	3
3.3	Multiple constructors, Constructors with default arguments & Dynamic constructor	1	3
3.4	Destructors	1	3
3.5	Operator overloading, Unary and Binary operator overloading	2	3
3.6	Overloading using friends	2	3
3.7	Rules for overloading	1	3
3.8	Type conversion	2	3
4.0	**Inheritance**	**10**	
4.1	Inheritance	1	3
4.2	Defining derived classes & Visibility modes	2	3
4.3	Single, Multilevel, Multiple, Hierarchical and Hybrid inheritance	4	3
4.4	Virtual base classes & Abstract classes-	1	3
4.5	Constructors in derived classes	1	3
4.6	Nesting of classes	1	3
5.0	**Pointers, Virtual Functions and Polymorphism, Working with Files**	**12**	
5.1	Pointers	2	3
5.2	Pointers to objects & this pointer	1	3
5.3	Pointers to derived classes	1	3
5.4	Virtual functions & Pure virtual functions	2	5
5.5	File Stream classes	1	4
5.6	Opening and closing a file- File opening modes	2	4
5.7	File pointers and their manipulations	1	4
5.8	Sequential input and output operations	2	4

Text Books for Reference

1. E. Balagurusamy - Object Oriented Programming with C++, Fifth edition, Tata McGraw Education Hill , 2011.

2. Ashok N. Kamthane, Object oriented Programming with ANSI & Turbo C++, First Edition, Pearson India

Text Books for Enrichment

1. Robert Lafore, Object Oriented Programming in Turbo C++, First Edition, Galgotia Publications.
2. D Ravichandran, Programming with C++, Second edition, Tata McGraw- Hil

Course	Details				
Code	**CA1812602**				
Title	**Software Lab-II**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Second semester**				
Type	**Core Practical**				
Credits	**2**	Hrs/Week	5 hours	Total Hours	90

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Apply DDL commands in SQL to create, modify, and remove database objects	U	2-4
2	Use Basic SQL queries INSERT, SELECT, DELETE, UPDATE to multiple tables	Ap	2-4
3	Show ordering of rows using ORDER BY option	Ap	2-4
4	Manipulate tables using SET operations	Ap	2-4
5	Apply complex queries in SQL	Ap	2-4
6	Make views in SQL	Ap	2-4
7	Apply the concepts of object-oriented programming	Ap	2-4
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**SQL - Data definition commands**	19	
1.1	Data definition command – CREATE.	1	1
1.2	Data definition commands - ALTER, DROP.	1	1
1.3	Adding Constraints.	1	1
1.4	primary key.	1	1
1.5	foreign key.	1	1
1.6	unique key.	1	1
1.7	Check and not null	2	1
1.8	Basic SQL queries INSERT, SELECT.	2	2
1.9	DELETE, UPDATE.	2	2
	Using multiple tables ordering of rows using ORDER BY option.	2	3
1.10	Set operations using UNION, EXCEPT and INTERSECT	3	4
1.11	Substring Comparison using LIKE operator, BETWEEN	2	4

	operator		
2.0	**Complex Queries**	**13**	
2.1	Complex Queries Nested Queries, EXISTS and UNIQUE/DISTINCT functions	3	5
2.2	NULL values, Renaming of attributes and Joining of tables	2	5
2.3	Aggregate functions and grouping.	2	5
2.4	Managing views.	1	6
2.5	Simple stored procedures.	3	6
2.6	Data Control commands - Access Control and Privilege commands	2	6
3.0	**Basic Concepts**	**12**	
3.1	Programs based on default arguments	1	7
3.2	Function overloading	3	7
3.3	Array of objects	2	7
3.4	Friend functions	3	7
3.5	Passing objects as arguments to function	3	7
4.0	**OOPs -I**	**16**	
4.1	Programs based on operator overloading (binary, unary) using member functions and friend functions.	7	7
4.2	Programs based on constructors	3	7
4.3	Different types of constructors	6	7
5.0	**OOPs -II**	**12**	
5.1	Programs based on inheritance	5	7
5.2	Different types of inheritance	7	7

Text Books for Reference

1. ReghuRamakrishnan and Johannes Gehrke- Database Management Systems , Third edition, McGraw Hill International Edition.

2. E. Balagurusamy - Object Oriented Programming with C++, Fifth edition, Tata McGraw Education Hill , 2011.

3. Ashok N. Kamthane, Object oriented Programming with ANSI & Turbo C++, First Edition, Pearson India

Text Books for Enrichment

1. RamezElmasri and ShamkantB.Bavathe - DATABASE SYSTEMS , Sixth Edition, Pearson Education

Scheme of Evaluation for software lab II external is as follows:

(There will be two questions; the first from DBMS and second from C++)

Division of Marks (Practical - 3 hours External)

First program - questions from DBMS **- 25 marks**

1. Logic – 10 marks

2.Successful compilation – 8 marks

3. Result – 7 marks

Second program – questions from Object Oriented Programming using C++ **- 35 marks**

1. Logic	– 20 marks
2.Successful compilation	–10 marks
3. Result	– 5 marks

Viva Voce **- 10 marks**

Lab Record **- 10 marks**

(DBMS -Minimum of 10 Programs

C++ -Minimum: of 15 Programs)

Total Marks **- 80 marks**

SEMESTER III

Course Code	Title of the Course	Course Category	Hours/ week	Credits
CA1813106	Computer Graphics	Core 6	4	4
CA1813107	Microprocessor and PC Hardware	Core 7	3	4
CA1813108	Operating Systems	Core 8	4	4
CA1813109	Data Structure using C++	Core 9	4	3
CA1813603	Software Lab III	Core Practical 3	6	2
ST1812204	Advanced Statistical Methods	Complementary II Statistics 2	4	4
		Total	**25**	**21**

Course	Details				
Code	**CA1813106**				
Title	**Computer Graphics**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Semester III**				
Type	**Core**				
Credits	**4**	Hrs/Week	4 hours	Total Hours	72

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	**Understand the working of different display system**	**U**	**1,6**
2	**Understand the basic principles of implementing computer graphics primitives**	**U**	**1,6**
3	**Use of geometric transformations on graphics objects and their application in composite form**	**U**	**1,6**
4	**Extract scene with different clipping methods and its transformation to graphics display device**	**U**	**1,6**
5	**Explore projections and visible surface detection techniques for display of 3D scene on 2D screen**	**U**	**1,6**
6	**Understand the basics of computer animation and animation language**	**U**	**1,6**
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO. No.
1.0	**Introduction.**	**12**	
1.1	A survey of Computer Graphics.	1	1
1.2	Overview of graphics systems.	1	1
1.3	Video display devices-Refresh CRT.	1	1
1.4	Raster-Scan and Random-Scan Displays.	1	1
1.5	Color CRT Monitors.	1	1
1.6	DVST.	1	1
1.7	Flat-Panel Displays.	1	1
1.8	Raster Scan systems.	1	1
1.9	Random scan systems.	1	1
1.10	Input devices.	1	1

1.11	Hard copy devices.	1	1
1.12	Graphics software.	1	1
2.0	**Output primitives**	14	
2.1	Line drawing algorithms.	3	2
2.2	DDA algorithm.	3	2
2.3	Bresenham‘s line algorithm	2	2
2.4	Circle generating algorithm	2	2
2.5	Midpoint circle algorithm	2	2
2.6	Character generation	2	2
3.0	**2D geometric Transformations**	18	
3.1	Basic transformations	1	3
3.2	Translation	1	3
3.3	Rotation	1	3
3.4	Scaling	1	3
3.5	Other transformations-Reflection and shear,	1	3
3.6	Matrix representation and homogenous coordinates	2	3
3.7	Composite transformation,	1	3
3.8	Interactive picture construction Techniques	1	3
3.9	Two-dimensional viewing:	1	
3.10	viewing pipeline	1	4
3.11	window and viewport	1	4
3.12	window to viewport transformation	1	4
3.13	Clipping operations- Point clipping	1	4
3.14	Line clipping	1	4
3.15	Cohen Sutherland line clipping, Polygon clipping	1	4
3.16	Sutherland- Hodgeman polygon clipping, Text Clipping.	2	4
4.0	**Three-dimensional concepts**	**14**	
4.1	Three dimensional display methods	3	5
4.2	Three dimensional object representations	3	5
4.3	Polygon surfaces	1	5
4.4	Sweep representations	2	5
4.5	Constructive solid geometry methods	3	5
4.6	Octrees and quadtrees	2	5
5.0	**Computer Animation**	**14**	
5.1	Design of animation sequences	3	6
5.2	Raster animations	3	6
5.3	Computer animation languages	2	6
5.4	key-frame systems	2	6
5.5	Morphing	2	6

5.6	Motion specifications	2	6

Text Books for Reference

1. Donald D.Hearn& M. Pauline Baker, Computer Graphics C Version, Second Edition,, PHI Pvt. Ltd.

Text Books for Enrichment

1. Newman W M & R F Sproul, Principles of Interactive Computer Graphics, Second Edition Mc-Graw Hill Publishers.
2. Plastock R & Xiang Z, Theory and problems of computer Graphics, Second Edition Schaum Series, McGraw Hill Publishers.

Course	Details				
Code	**CA1813107**				
Title	**Microprocessor and PC Hardware**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Third semester**				
Type	**Core**				
Credits	**4**	Hrs/Week	3 hours	Total Hours	54

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Explain the general architecture of a microcomputer system and architecture organization of 8085	U	2,6
2	Classify the instruction set of 8085 microprocessor and distinguish the use of different instructions	Ap	2,6
3	Identify different components and their functions on the motherboard	U	2,6
4	Explain the operation of hard disk	U	2,6
5	Identify the distinguishing features of physical memory, memory modules and memory areas.	U	2,6
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Microprocessor** 8085	10	
1.1	Introduction- Evolution of microprocessors	1	1
1.2	The concept of 8085 - Intel 8085 introduction	1	1
1.3	Architecture	1	1
1.4	Pin diagram	2	1
1.5	Instruction cycle	1	1
1.6	Timing diagrams	2	1
1.7	Interrupts of Intel 8085	2	1
2.0	**Instruction Set of Intel 8085**	10	
2.1	Introduction	1	2
2.2	Instruction and data format	3	2
2.3	Addressing modes	3	2
2.4	Status flags	1	2

2.5	Intel 8085 instruction set.	2	2
3.0	**Motherboard**	**12**	
3.1	Components of motherboard	1	3
3.2	Expansion slots	1	3
3.3	Processor socket, coprocessor	1	3
3.4	memory modules	1	3
3.5	BIOS and CMOS	1	3
3.6	Chipset. Super I/O chip	1	3
3.7	ROM BIOS	1	3
3.8	System buses- Processor Buses,	1	3
3.9	Memory buses	1	3
3.10	I/O Bus(ISA,PCI Local Bus, AGP, USB),	2	3
3.11	Motherboard selection criteria.	1	3
4.0	**Hard disk**	**10**	
4.1	Hard Disk drive - Definitions	1	4
4.2	Hard Disk operations	2	4
4.3	Disk formatting	1	4
4.4	Basic hard disk drive components	1	4
4.5	Hard disk features	1	4
4.6	Hard disk drive installation procedure	1	4
4.7	FAT Disk, VFAT	1	4
4.8	FAT 32	1	4
4.9	NTFS	1	4
5.0	**Types of memory**	**12**	
5.1	Physical Memory	2	5
5.2	Memory modules:- SIMMs	2	5
5.3	DIMMs, RIMMs	2	5
5.4	Brief study of conventional base memory	2	5
5.5	Upper memory area	1	5
5.6	High memory area	1	5
5.7	Extended memory	1	5
5.8	Expanded memory.	1	5

Text Book for Reference

1. B Ram -Fundamentals of microprocessors and microcontrollers, Seventh revised edition, Dhanpat Rai Publications.
2. ManaharLotia and Pradeep Nair- All about motherboard, First edition, 2005, BPB Publications..
3. ManaharLotia and Pradeep Nair- Modern all about Hard Disk Drive, First edition, BPB Publications.

Text Book for Enrichment

1. Scott Mueller - Upgrading and repairing PCs , 18th Edition, Pearson.
2. R S. Gaonkar- Micro processor Architecture, Programming and applications with 8085, Sixth Edition, PENRAM International Publishing.

Course	Details				
Code	**CA1813108**				
Title	**Operating System**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Third Semester**				
Type	**Core**				
Credits	4	Hrs/Week	4 hours	Total Hours	72

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	**Discuss fundamental concepts, structure and design of operating Systems**	**U**	**2,6**
2	**Explain inter-process communication**	**U**	**2,6**
3	**Inter-process scheduling and scheduling algorithms**	**Ap**	**2,6**
4	**Describe process coordination and synchronization**	**U**	**2,6**
5	**Explain different approaches to memory management.**	**U**	**2,6**
6	**Describe secondary storage management and disk scheduling**	**U**	**2,6**
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Introduction**	10	
1.1	OS Definition	1	1
1.2	Functions	1	1
1.3	Evolution of OS	1	1
1.4	OS Structure	1	1
1.5	Operating System Operations	1	1
1.6	Operating System Services,	2	1
1.7	User Operating System Interface	1	1
1.8	System Calls	1	1
1.9	Types of System Calls	1	1
2.0	**Process**	**14**	
2.1	Basic Concepts	1	2
2.2	Process Scheduling	2	2
2.3	Operations on Processes	2	2
2.4	Inter process communication	2	3

2.5	Scheduling Criteria	1	3
2.6	Scheduling Algorithms	4	3
2.7	Multiple Processor Scheduling	2	3
3.0	**Process Coordination**	**18**	
3.1	Synchronization	1	4
3.2	The Critical Section problem,	1	4
3.3	Semaphores	1	4
3.4	Classic Problems of Synchronization,	2	4
3.5	Monitors	2	4
3.6	Deadlocks	1	4
3.7	System Model	1	4
3.8	Deadlock Characterization	1	4
3.9	Methods of handling Deadlocks	1	4
3.10	Deadlock Prevention	2	4
3.11	Deadlock Avoidance	2	4
3.12	Deadlock Detection	2	4
3.13	Recovery from Deadlock	1	4
4.0	**Memory Management**	**16**	
4.1	Memory Management Strategies	2	5
4.2	Swapping	2	5
4.3	Contiguous memory allocation	2	5
4.4	Paging	2	5
4.5	Segmentation	2	5
4.6	Virtual Memory Management	2	5
4.7	Demand paging	2	5
4.8	Page Replacement	2	5
5.0	**Storage Management:**	14	
5.1	File System	1	6
5.2	File concept	1	6
5.3	Access Methods	2	6
5.4	Directory structure	2	6
5.5	Implementing File Systems	1	6
5.6	File System Structure	2	6
5.7	Allocation Methods	2	6
5.8	Free Space Management	1	6
5.9	Disk Scheduling	2	6

Text Books for Reference

1. Abraham Silberschatz, Peter Galvin and Greg Gagne - Operating System Principles, Seventh Edition, John Wiley

2. William Stallings - Operating Systems, Sixth Edition, Prentice Hall of India, Pearson

Text Books for Enrichment

1. Milan Kovic - Operating Systems, 2ndEdition, (TMH)

Course	Details				
Code	**CA1813109**				
Title	**Data Structures using C++**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Third Semester**				
Type	**Core**				
Credits	3	Hrs/Week	4 hours	Total Hours	72

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	**Discuss the provisions in C++ to organize and manipulate data structures using array**	**U**	**2,4**
2	**Understand stack and queue executions in terms of C++ derived data type.**	**U**	**2,4**
3	**Apply the concepts of dynamic memory allocation for the formation of linked list and for garbage collection**	**Ap**	**2,4**
4	**Apply tree terminology for data manipulations**	**Ap**	**1,2,4**
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Concept of Structured data**	**12**	
1.0	Concept of Structured data	1	1
1.1	Data structure definition	1	1
1.2	Different types and classification of data structures	1	1
1.3	Arrays, Memory allocation, implementation of arrays in memory and array operations	2	1
1.4	Applications of sparse matrix representation and operations,	2	1
1.5	Polynomials representation and addition	1	1
1.6	Concept of search and sort	1	1
1.7	Linear search, binary search	1	1
1.8	Selection sort, insertion sort and quick sort	2	1
2.0	**Stacks and Queues**	**12**	
2.1	Stacks – Concepts	1	2
2.2	Organization and operations on stacks using arrays (static), examples	1	2
2.3	Conversion of infix to postfix and infix to prefix, postfix evaluation	2	2
2.4	Subprogram calls and execution	1	2
2.5	Multiple stacks representation	1	2
2.6	Queues - Concepts,	1	2
2.7	Organization and operations on queues, examples,	1	2
2.8	Limitations of linear queue.	1	2

2.9	Organization and operations on circular queue	1	2
2.10	Double ended queue.	1	2
2.11	Priority queue	1	2
3.0	**Linked list**	**18**	
3.1	Concept of dynamic data structures	1	3
3.2	Linked list	1	3
3.3	Types of linked list	2	3
3.4	Linked list using pointers	2	3
3.5	Insertion and deletion examples	3	3
3.6	Circular linked list	2	3
3.7	Doubly linked lists	2	3
3.8	Application of linked stacks and queues	2	3
3.9	Memory management basic concepts	1	3
3.10	Garbage collection.	2	3
4.0	**Trees**	**15**	
4.1	Concept of recursion	1	4
4.2	Trees, tree terminology	1	4
4.3	Binary trees, representation of binary trees	2	4
4.4	Strictly binary trees, complete binary tree	2	4
4.5	Extended binary trees	1	4
4.6	Creation and operations on binary tree	2	4
4.7	Binary search trees, Creation of binary search tree	2	4
4.8	Tree traversing methods – examples	2	4
4.9	Binary tree representation of expressions	2	4
5.0	**File**	**15**	
5.1	Definition, Operations on file (sequential)	2	4
5.2	File organizations - sequential	1	4
5.3	File organizations - Indexed sequential	1	4
5.4	File organizations - random files	1	4
5.5	Linked organization, inverted files	2	4
5.6	Cellular partitioning	2	4
5.7	Hashing	1	4
5.8	Hash tables, hashing functions	3	4
5.9	Collisions, collision resolving methods	2	4

Text Books for Reference

1. G.S Baluja - Data Structures Through C++ (A Practical Approach), Second Edition-2004, DanapatRai& Co.
2. Ellis Horowitz and SartajSahni - Fundamentals of Data Structures in C++ , Second Edition, Galgotia Publiction

Text Books for Enrichment

1. Seymour Lipschutz, Theory and Problems of Data Structures, Schaums Outline Series,2006, McGraw Hill
2. YedidyahLanngsam, Moshe Augustein, Aaron M Tenenbaum- Data structures using C and C++, Second Edition, Prentice Hall

Course	Details				
Code	**CA1813603**				
Title	**Software Lab-III**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Third semester**				
Type	**Core Practical**				
Credits	**2**	Hrs/Week	6 hours	Total Hours	108

CO No.	*Expected Course Outcomes* *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	**Implement sorting and searching algorithms using Arrays.**	**Ap**	**2,4**
2	**Apply various data structure stacks, queues using arrays**	**Ap**	**2,4**
3	**Implement linked list using dynamic memory allocation**	**Ap**	**2,4**
4	**Show tree traverse technique to various applications**	**Ap**	**2,4**
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Array**	**26**	
1.1	Insertion , Deletion, Polynomial addition using arrays	6	1
1.2	Sort – Selection, Insertion, Quick	7	1
1.3	Search – Linear search, Binary search	6	1
1.4	Sparse matrix – Sparse form representation, transpose and addition using the sparse form	7	1
2.0	**Stack and Queue**	**23**	
2.1	Stack implementation using arrays (linear stack)	7	2
2.2	Infix to postfix conversion, Postfix evaluation	5	2
2.3	Queue implementation using arrays (linear queue)	6	2
2.4	Implementation of circular queue	5	2
3.0	**Linked List**	**27**	
3.1	Singly linked list – Implementation using dynamic memory allocation techniques, arrange the list based on	8	3

	the ascending or descending order of the information field		
3.2	Concatenate two linked lists, interchange any two nodes in a list	6	3
3.3	Implementation of circular list	6	3
3.4	Implementation of linked stacks and queues	7	3
4.0	**Doubly linked list**	**32**	
4.1	Implementation of doubly linked list	7	3
4.2	Implementation of circular doubly linked list	8	3
5.0	**Trees**		
5.1	Creation of binary search trees	6	4
5.2	Insertion and deletion of nodes	6	4
5.3	Tree traversals	5	4

Text Books for Reference

G.S Baluja - Data Structures Through C++ (A Practical Approach), Second Edition-2004, DanapatRai& Co.

Text Books for Enrichment

E. Balagurusamy - Object Oriented Programming with C++, Fifth edition, Tata McGraw Education Hill , 2011

Scheme of Evaluation for software lab III external is as follows

(There will be two questions)

Division of Marks (Practical - 3 hours External)

First program - questions from module 1 & II **- 25 marks**
1. Logic – 10 marks
2.Successful compilation – 8 marks
3. Result – 7 marks

Second program – questions from module III & IV **- 35 marks**
1. Logic – 20 marks
2.Successful compilation –10 marks
3. Result – 5 marks

Viva Voce **- 10 marks**
Lab Record **- 10 marks**
(Minimum of 25 Programs)
Total Marks **- 80 marks**

Course	Details				
Code	ST1812204				
Title	**ADVANCED STATISTICAL METHODS**				
Degree	BCA				
Branch(s)	Computer Science				
Year/Semester	Third semester				
Type	Complementary				
Credits	4	Hours/week	4	Total hours	72

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Differentiate various probability distributions.	An,Ap	1
2	Define the statement of central limit theorem.	R, U	1
3	Recognize the sampling distributions.	U	1
4	Understand the concept of estimation.	U	1
5	Test statistical hypotheses.	U	1
6	Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit.	U, Ap	1

Module	Course Description	Hrs	CO.No.
1.0	**Theoretical distributions**	**23**	1
1.1	Discrete distribution	2	1
1.2	Uniform-mean, variance, moment generating functions.	1	1
1.3	Binomial-mean, variance, moment generating functions and fitting of data.	4	1
1.4	Poisson-mean, variance, moment generating functions and fitting of data.	4	1
1.5	Continuous distribution	2	1
1.6	Uniform-mean, variance, moment generating functions	2	1
1.7	Normal distribution-important properties (without proof) of the distribution, mean, variance, moments, mgf.	4	1
1.8	M.D. and Q.D Area under the normal curve-related problems	4	1

2.0	**Sampling Distributions**	**13**	
2.1	Definition, Statistic, Parameter, Standard Error	2	2,3
2.2	Sampling Distributions of Mean of the sample from Normal population and distribution of Variance(form alone)	3	3
2.3	$\chi 2$ distribution(without derivation), properties, Interrelationships.	2	3
2.4	t distribution(without derivation), properties, Interrelationships.	2	3
2.5	F distribution(without derivation), properties	2	3
2.6	Interrelationship of $\chi 2$, t, F distributions	2	3
3.0	**Estimation of parameters**	**18**	
3.1	Point Estimation	2	4
3.2	Properties of Estimation-Unbiasedness	2	4
3.3	Properties of Estimation- Efficiency	2	4
3.4	Properties of Estimation- Consistency	2	4
3.5	Properties of Estimation- Sufficiency	2	4
3.6	Interval estimation for mean, variance of normal population and proportion of binomial population	2	4
3.7	Methods of estimation-method of moments	3	4
3.8	Methods of estimation- method of maximum likelihood.	3	4
4.0	**Testing of hypotheses**	**18**	
4.1	Statistical hypotheses-Simple and composite hypotheses, Null and Alternate hypothesis	4	5
4.2	Type I and Type II errors, Critical Region, Size of the test, P value, Power, Neyman Pearson approach	4	5
4.3	Large Sample test -Z test	2	5
4.4	Large Sample test - t test	2	5
4.5	Large Sample test - Chi-Square test-goodness of fit	3	5,6
4.6	Large Sample test - test of independence	3	5,6

References:

1. S.C. Gupta and V.K. Kapoor: *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons
2. S.C Gupta*: Fundamentals of Mathematical Statistics*, Sultan Chand and Sons.
3. V.K. Rohatgi: *An Introduction to Probability Theory and Mathematical Statistics*, Wiley Eastern

SEMESTER IV

Course Code	Title of the Course	Course Category	Hours/ week	Credits
CA1814604	Design and Analysis of Algorithms	Core 10	4	4
CA1814110	System Analysis & Software Engineering	Core 11	4	4
CA1814111	Linux Administration	Core 12	4	4
CA1814112	Web Programming using PHP	Core 13	3	3
CA1814113	Software Lab IV	Core Practical 3	6	2
MT1814207	Operational Research	Complementary I –Mathematics 3	4	4
		Total	**25**	**21**

Course	Details				
Code	**CA1814110**				
Title	**Design and Analysis of Algorithms**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Fourth Semester**				
Type	**Core**				
Credits	**4**	Hrs/Week	4 hours	Total Hours	72

CO No.	*Expected Course Outcomes* *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	**Describe the basics of algorithms**	**U**	**3,4**
2	**Apply the theory of space complexity , time complexity and their notations in problem solving**	**Ap**	**3,4**
3	**Analyse the general strategies and the algorithms based on them**	**An**	**3,4**
4	**Explain basic traversals on tree and search methods on graphs**	**U**	**3,4**
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Introduction**	**12**	
1.1	Definition of Algorithm	1	1
1.2	Algorithm design techniques	2	1
1.3	Algorithm Analysis	2	1
1.4	Performance analysis - space complexity	2	2
1.5	Performance analysis- time complexity	3	2
1.6	Best, Worst, And average case complexity	2	2
2.0	**Divide and Conquer method**	**14**	
2.1	Divide and Conquer General method.	2	3
2.2	Binary search,	1	3
2.3	Finding the maximum and minimum.	1	3
2.4	Merge sort.	2	3
2.5	Quick sort.	2	3
2.6	Performance measurement of quick sort,	2	3
2.7	Selection.	2	3
2.8	Strassen‘s matrix multiplication.	2	3
3.0	**Greedy Algorithm**	**18**	
3.1	General Characteristics of greedy algorithms	3	3
3.2	Knapsack problem	4	4

3.3	Minimum Spanning trees	3	4
3.4	Kruskal‘s algorithm	4	4
3.5	Prim‘s algorithm	4	3
4.0	**Dynamic programming**	**16**	
4.1	Dynamic programming- the general method	3	3
4.2	Multistage graphs	3	3
4.3	All-pairs shortest path	2	3
4.4	Single source shortest path	3	3
4.5	0/1 Knapsack problem	3	3
4.6	Traveling Sales person problem	2	3
5.0	**Basic traversals, Search techniques & Backtracking**	**12**	
5.1	Basic traversals	1	4
5.2	Search techniques - BFS and traversal, DFS and traversal	2	4
5.3	Bi-connected components and DFS	1	4
5.4	Backtracking General method	1	4
5.5	8-queens problem	2	4
5.6	Sum of subsets problem	2	4
5.7	Graph coloring	1	4
5.8	Hamiltonian cycles	2	4

Text Books for Reference

1. Ellis Horowitz, SartajSahni, SanguthevarRajasekharan, Computer algorithms/C++,Second

Text Books for Enrichment

1. AnanyLevitin- Introduction to design and analysis of algorithms,
Third Edition, Addison Wesley, Low price edition.

2. Richard Neapolitan &KumarssNaimipour,Foundation of Algorithms using C++ Pseudocode, Third edition, Jones and Bartlett Publishers.

Course	Details				
Code	**CA1814111**				
Title	**System Analysis & Software Engineering**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Fourth Semester**				
Type	**Core**				
Credits	**4**	Hrs/Week	4 hours	Total Hours	72

CO No.	*Expected Course Outcomes* *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	**Understand the significance of system analysis, design and development**	**U**	**2,3**
2	**Understand the process of system modelling in detail**	**U**	**2,3,8**
3	**Use the engineering technique of requirement elicitation**	**U**	**2,3,8**
4	**Understand cost model techniques in software engineering**	**U**	**2,3,8**
5	**Interpret the standardized system design methods in software production**	**Ap**	**2,3,8**
6	**Make use of system testing and validation in the development life cycle**	**U**	**2,5,8**
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**System Analysis**	12	
1.1	Information systems concepts	1	1
1.2	Business information systems	1	1
1.3	Describing the business organization & organization chart	1	1
1.4	Organization function list	1	1
1.5	Information system levels - operational, lower, middle, top management	2	1
1.6	SDLC Life cycle activities- life cycle flow chart	3	1
1.7	Task, management review	1	1
1.8	Baseline specifications	1	1
1.9	Role of system analyst	1	1

2.0	**Introduction to Software Engineering**	**14**	
2.1	Introduction to Software Engineering	1	2
2.2	Definition, Program Vs Software, and Software process	1	2
2.3	Software Characteristics	1	2
2.4	Brief introduction about product and process	1	2
2.5	Software process and product matrices.	2	2
2.6	Software life cycle models , Definition	1	2
2.7	Waterfall model	1	2
2.8	Increment process model- Iterative	1	2
2.9	Increment process model - RAD	1	2
2.10	Evolutionary process model -Prototyping	1	2
2.11	Evolutionary process model - Spiral	1	2
2.12	Selection of a life cycle model	2	2
3.0	**Software Requirement Analysisand Specification**	**18**	
3.1	Requirements Engineering	1	3
3.2	Type of requirements	2	3
3.3	Feasibility Studies	2	3
3.4	Requirement Elicitation – Use Case	1	3
3.5	DFD, Data Dictionaries	2	3
3.6	Various steps for requirement analysis	2	3
3.7	Requirement documentation	1	3
3.8	Requirement validation	1	3
3.9	An example to illustrate the various stages in Requirement analysis.	2	3
3.10	Project planning-Size estimation, cost estimation	2	3
3.11	The constructive cost model (COCOMO)	2	4
4.0	**Software Design**	**14**	
4.1	Definition, Various types	1	5
4.2	Objectives and importance of Design phase	1	5
4.3	Modularity	2	5
4.4	Strategy of design	1	5
4.5	Function oriented design	1	5
4.6	IEEE recommended practice for software design, descriptions	1	5
4.7	Steps to Analyse and Design Objected Oriented System	2	5
4.8	Software Reliability Definition	1	5
4.9	McCall software quality model	2	5
4.10	Capability Maturity Model	2	5
5.0	**Software Testing**	**14**	
5.1	What is testing?, Test, Test case and Test Suit	1	6
5.2	Verification and Validation	1	6
5.3	Alpha, beta and acceptance testing, functional testing	2	6
5.4	Techniques to design test cases, boundary value analysis	1	6
5.5	Equivalence class testing, decision table based testing	2	6
5.6	Cause effect graphing technique	1	6
5.7	Structural testing path testing	1	6

5.8	Graph matrices	1	6
5.9	Data flow testing	1	6
5.10	Levels of testing	1	6
5.11	Unit testing, integration testing	1	6
5.12	System testing, validation testing	1	6

Text Books for Reference

1. Marvin Gore & John Stubbe -Elements of System Analysis
   Fourth Edition, Galgotia Book Source.

2. K K Aggarwal, Yogesh Singh - Software Engineering,
Third Edition, New Age International Publications

Text Books for Enrichment

1. Roger S Pressman - Software Engineering: A Practitioner's Approach
   Sixth Edition, McGraw-Hill Higher Education.

2. Ian Sommerville - Software Engineering, Seventh Edition,
   Pearson Education
3. PankajJalote - An Integrated approach to Software Engineering,
   Second Edition, Narosa Publishing Company

Course	Details				
Code	**CA1814112**				
Title	**Linux Administration**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Fourth Semester**				
Type	**Linux Administration**				
Credits	**4**	Hrs/Week	4 hours	Total Hours	72

O No.	*Expected Course Outcomes* *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	**Explain the fundamental concepts of open-source operating system Linux**	**U**	**2,6**
2	**Understand the basic set of commands and editors in Linux operating system.**	**U**	**2,6**
3	**Discuss shell programming in Linux operating system**	**U**	**2,6**
4	**Demonstrate the role and responsibilities of a Linux system administrator.**	**Ap**	**2,6**
5	**Distinguishvarious filter and server commands**	**U**	**2,6**
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Overview of Linux**	**12**	
1.1	What is Linux	1	1
1.2	Linux‘s root in Unix	1	1
1.3	Common Linux Features	1	1
1.4	advantage of Linux	1	1
1.5	Overview of Unix and Linux architectures	1	1
1.6	Linux files system	1	1
1.7	hardware requirements for Linux	1	1
1.8	Linux standard directories	1	1
1.9	Commands for files and directories cd, ls, cp, rm, mkdir,	1	1
1.10	rmdir, pwd, file, more, less	1	1
1.11	Creating and viewing files using cat	1	1
1.12	file comparisons	1	1
2.0	**Essential Linux commands**	**15**	
2.1	Processes in Linux	1	2

2.2	Process fundamentals	1	2
2.3	Connecting processes with pipes	1	2
2.4	Redirecting input	1	2
2.5	Redirecting output	1	2
2.6	Background processing	1	2
2.7	Managing multiple processes	1	2
2.8	Process scheduling – (at,batch)	1	2
2.9	nohup command,	1	2
2.10	kill, ps, who	1	2
2.11	find, sort, touch, file	1	2
2.12	file processing commands - wc, cut, paste etc	1	2
2.13	Mathematical commands - expr, factor etc	1	2
2.14	Creating files with vi editor.	1	2
2.15	Editing files with vi editor.	1	2
3.0	**Shell programming**	**15**	
3.1	Basics of shell programming	1	3
3.2	various types of shell available in Linux	2	3
3.3	Comparisons between various shells	2	3
3.4	Shell programming in bash	1	3
3.5	Conditional statements	1	3
3.6	Looping statements.	1	3
3.7	Case statement	1	3
3.8	Parameter passing and arguments	2	3
3.9	Shell variables	1	3
3.10	System shell variables	1	3
3.11	shell keywords	1	3
3.12	Creating Shell programs for automating system tasks	1	3
4.0	**System administration**	**18**	
4.1	Common administrative tasks	1	4
4.2	identifying administrative files	1	4
4.3	Configuration and log files	1	4
4.4	Role of system administrator	1	4
4.5	Managing user accounts-adding users	1	4
4.6	Managing user accounts-deleting users	1	4
4.7	Changing permissions and ownerships	1	4
4.8	Creating and managing groups	1	4
4.9	Modifying group attributes	1	4
4.10	Temporary disabling of users accounts	1	4
4.11	Creating and mounting file system	1	4
4.12	Checking and monitoring system performance	1	4
4.13	file security & Permissions	1	4
4.14	becoming super user using su	1	4
4.15	Getting system information with uname, host name	1	4
4.16	Disk partitions & sizes	1	4

4.17	users, kernel, installing and removing packages	1	4
4.18	rpm command	1	4
5.0	**Simple filter commands & Understanding various Servers.**	**12**	
5.1	Filter Commands-pr, head, tail	1	5
5.2	Filter Commands -cut, sort.	1	5
5.3	Filter Commands- uniq, tr.	1	5
5.4	Filter using regular expression grep.	1	5
5.5	Filter using regular expression egrep, sed	1	5
5.6	DHCP	1	5
5.7	DNS	1	5
5.8	Squid	1	5
5.9	Apache	1	5
5.10	Telnet	1	5
5.11	FTP	1	5
5.12	Samba	1	5

Text Books for Reference

1. Cristopher Negus - Red Hat Linux Bible, Wiley Dreamtech India 2005 edition.
2. YeswantKanethkar - UNIX Shell Programming, First edition, BPB.

Text Books for Enrichment

References :

1. Official Red Hat Linux Users guide by Redhat, Wiley Dreamtech India

2. Graham Glass & King Ables - UNIX for programmers and users, Third Edition, Pearson Education.

3. Neil Mathew & Richard Stones - Beginning Linux Programming, Fourth edition, Wiley Dreamtech India.

Course	Details				
Code	**CA1814113**				
Title	**Web Programming Using PHP**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Fourth semester**				
Type	**Core**				
Credits	**3**	Hrs/Week	3 hours	Total Hours	54

CO No.	*Expected Course Outcomes* *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	**Describe fundamentals of web**	**U**	**2,5,7**
2	**Introduce the creation of static webpage using HTML**	**U**	**2,5,7**
3	**Describe the importance of CSS in web development**	**U**	**2,5,7**
4	**Describe the function of JavaScript as a dynamic webpage creating tool**	**U**	**2,5,7**
5	**Distinguish PHP as a server side programming language**	**U**	**2,5,7**
6	**Outline the principles behind using MySQL as a backend DBMS with PHP**	**U**	**2,5,7**
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Introduction to web**	**8**	
1.1	Introduction	1	1
1.2	WWW architecture, Fundamentals of HTML	1	2
1.3	Text formatting tags, marquee	1	2
1.4	Inserting images, Links	1	2
1.5	Lists	1	2
1.6	Creating tables	1	2
1.7	Frames	1	2
1.8	Working with form elements	1	2
2.0	**Cascading Style Sheets**	**10**	
2.1	CSS introduction, <link> and <style> elements	1	3
2.2	CSS properties	1	3
2.3	Controlling Fonts, Text formatting	1	3
2.4	Text- pseudo classes, Selectors, Links, Backgrounds,	1	3

	lists		
2.5	Introduction to Java Script,	1	3
2.6	Java Script variables, operators, decision control statements	1	4
2.7	Looping and arrays	1	4
2.8	Functions and events	1	4
2.9	Popup boxes-alert, prompt, conform box	1	4
2.10	Built-in objects, writing JavaScript form validation	1	4
3.0	**Introduction to PHP**	**10**	
3.1	Introduction	1	5
3.2	Server side scripting	1	5
3.3	Role of web server software	1	5
3.4	PHP comments, variables	1	5
3.5	echo and print	1	5
3.6	PHP operators, data types	1	5
3.7	Branching statements	1	5
3.8	Loops	1	5
3.9	Arrays	2	5
4.0	**PHP functions, Cookie, Error Handling in PHP & OOP using PHP**	**12**	
4.1	PHP functions	2	5
4.2	PHP form	1	5
4.3	Passing information between pages, $_GET, $_POST, $_REQUEST.	1	5
4.4	String functions	1	5
4.5	include and require	1	5
4.6	session and cookie management	2	5
4.7	Error handling in PHP	2	5
4.8	Object Oriented Programming using PHP	2	5
5.0	**PHP with MYSQL**	**14**	
5.1	Introduction to MySQL, datatypes,	2	6
5.2	SQL commands-CREATE, UPDATE, INSERT, DELETE, SELECT,	2	6
5.3	PHP functions for MySQL connectivity and operation- mysql_connect, mysql_select_db, mysql_query	3	6
5.4	mysql_fetch_row, mysql_fetch_array, mysql_result, mysql_list_fields, mysql_num_fields, insertion	3	6
5.5	Updation and deletion of data using PHP	2	6
5.6	Displaying data from MySQL in webpage	2	6

Text Books for Reference

1. Dave W Mercer, Allan Kent, Steven D Nowicki, David Mercer, Dan Squier, Wankyu Choi - Beginning PHP‖, Wiley Publishing, Inc
2. Ivan Bayross -"HTML, DHTML, JavaScript, Pearl & CGI", Fourth Revised Edition, BPB Publication
3. "Programming PHP",RasmusLerdorf and Kevin Tatore, Shroff Publishers & Distributors Pvt.Ltd
4. "Beginning PHP", Dave W Mercer, Allan Kent, Steven D Nowicki, David Mercer, Dan Squier, Wankyu Choi, Wiley Publishing, In

Course	Details				
Code	**CA1814604**				
Title	**Software Lab IV**				
Degree	BCA				
Branch(s)	**Computer Science**				
Year/Semester	**Fourth Semester**				
Type	**Software Lab IV**				
Credits	2	Hrs/Week	6 hours	Total Hours	108

CO No.	*Expected Course Outcomes* *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	**Understand the Linux Architecture and command usage**	**U**	**2,6**
2	**Practice shell scripting and essential shell programming**	**Ap**	**2,6**
3	**Use HTML and Java script for web designing**	**Ap**	**2,6**
4	**Write simple programs using the server side scripting language PHP.**	**Ap**	**2,4**
5	**Write programs for MySQL**	**Ap**	**2,4**
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Linux**	**42**	
1.1	Getting started –Commands	7	1
1.2	The Linux Architecture and command usage Commands, General purpose utilities	5	1
1.3	The File system –Commands	5	1
1.4	Process related commands	5	1
1.5	Handling ordinary files, Basic file attributes	5	1
1.6	The vi editor	2	1
1.7	Simple Filters, Filters using regular expressions-use of grep command	5	1
1.8	Introduction to shell concept and writing shell script	2	2
1.9	Introduction to shell concept and writing shell script, Essential Shell Programming	2	2
1.10	User management, monitoring system performance, disk usage	4	2
2.0	**Web Programming using PHP**	**66**	
2.1	Creating programs based on HTML	15	3
2.2	Creating Java script based programs	15	3
2.3	Creating simple programs based on PHP	16	4
2.4	Programs using PHP functions	10	4

2.5	Programs based on MY SQL	10	5

Text Books for Reference

1. Official Red Hat Linux Users guide by Redhat, Wiley Dreamtech India
2. Graham Glass & King Ables - UNIX for programmers and users, Third Edition, Pearson
3. Dave W Mercer, Allan Kent, Steven D Nowicki, David Mercer, Dan Squier

Scheme of Evaluation for software lab IV external is as follows:

There will be two questions; the first from LINUX and second from PHP)

Division of Marks (Practical - 3 hours External)

First program - questions from LINUX **- 25 marks**

1. Logic – 10 marks
2. Successful compilation – 8 marks
3. Result – 7 marks

Second program – questions from PHP **- 35 marks**

1. Logic – 15 marks
2. Successful compilation –15 marks
3. Result – 5 marks

Viva Voce **- 10 marks**

Lab Record **- 10 marks**

(LINUX -Minimum of 10 Programs

PHP -Minimum of 15 Programs)

Total Marks **- 80 marks**

SEMESTER V

Course Code	Title of the Course	Course Category	Hours/ week	Credits
CA1815114	Computer Networks	Core 14	**3**	**4**
CA1815115	IT and Environment	Core 15	**4**	**4**
CA1815116	Java Programming using Linux	Core 16	**3**	**3**
CA1815401	Computer Fundamentals, Internet & MS Office	Open Course	**4**	**3**
CA1815605	Software Lab V	Core Practical 5	**5**	**2**
CA1815801	Software Development Lab I (Mini Project)	Project work 1	**6**	**2**
		Total	**25**	**18**

Course	Details				
Code	**CA1815114**				
Title	**Computer Networks**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Fifth Semester**				
Type	**Core**				
Credits	4	Hrs/Week	3 hours	Total Hours	54

CO No.	*Expected Course Outcomes* *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	**Understand the concepts of signals and OSI-layer functions.**	**U**	**2,6**
2	**cus the process of Multiplexing, switching and difference between guided and unguided media in networks.**	**U**	**2,6**
3	**Describe, analyse and compare a number of data link, network, and transport layer protocols**	**R**	**2,6**
4	**Have a basic knowledge of the use of cryptography and network security**	**U**	**2,6**
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Introduction**	**10**	
1.1	Introduction to Networks	1	1
1.2	Data and signals-analog and digital	1	1
1.3	Periodic analog signals, digital signals, Bit rate, baud rate, bandwidth	1	1
1.4	Transmission impairments- attenuation, distortion and noise.	1	1
1.5	Data communication protocols and standards	1	1
1.6	Network models - OSI model-layers and their functions.	3	1
1.7	TCP/IP protocol suite	2	1
2.0	**Multiplexing, Transmission Media and Switching**	**10**	
2.1	Bandwidth utilization Multiplexing: FDM.	1	2
2.2	TDM	1	2
2.3	Spread spectrum.	1	2

2.4	Transmission Media- guided media	1	2
2.5	Unguided media.	1	2
2.6	Switching: message switching	1	2
2.7	Circuit switching	1	2
2.8	Packet switched networks.	1	2
2.9	datagram networks	1	2
2.10	virtual- circuit networks	1	2
3.0	**Data link layer:**	**12**	
3.1	Error Detection and Correction	1	3
3.2	Framing.	1	3
3.3	flow and error control.	1	3
3.4	Protocols - Noiseless channels (Simplest, Stop and Wait)	2	3
3.5	Noisy channels (Stop and Wait and Piggy Backing).	2	3
3.6	Multiple Access Protocols.	1	3
3.7	Random Access-ALOHA, CSMA.	1	3
3.8	Wired LANs-IEEE standards	2	3
3.0	Wireless LANs-Bluetooth, Cellular Telephony	1	3
4.0	**Network layer and Transport layer**	**12**	
4.1	Repeaters, Bridges	1	3
4.2	Gateways and routers	1	3
4.3	Logical addressing – IPV4	1	3
4.4	Logical addressing- IPV6	1	3
4.5	Internet protocol - IPV4.	1	3
4.6	Internet protocol -IPV6	1	3
4.7	Connectionless service-UDP	2	3
4.8	Connection Oriented Services-TCP	2	3
4.9	Congestion Control	1	3
4.10	Quality of Service	1	3
5.0	**Application layer**	**10**	
5.1	HTTP	1	4
5.2	FTP	1	4
5.3	SMTP	1	4
5.4	DNS.	1	4
5.5	Network security:	1	4
5.6	Common Threats- Firewalls (advantages and disadvantages)	2	4
5.7	Cryptography.	3	4

Text Books for Reference

1. B. A. Forouzan - Data communication and Networking, Fourth edition-,TMH
2. Andrew S Tanenbaum - Computer Networks ,Fourth Edition, Prentice Hall of India.

References :

1. Official Red Hat Linux Users guide by Redhat, Wiley Dreamtech India
2. Graham Glass & King Ables - UNIX for programmers and users, Third Edition, Pearson Education.
3. Neil Mathew & Richard Stones - Beginning Linux Programming, Fourth edition, Wiley Dreamtech India.

Course	Details				
Code	**CA1815115**				
Title	**IT, Environment and Human Rights**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Fifth Semester**				
Type	**Core**				
Credits	**4**	Hrs/Week	4 hours	Total Hours	72

co No.	***Expected Course Outcomes*** ***Upon completion of this course, the students will be able to:***	**Cognitive level**	**PSO No.**
1	Identify various types of natural resources, human impact on	R	9
2	Develop skills and a commitment to act independently and collectively to sustain and enrich the environment.	u	9,12
3	Understand the multidisciplinary nature, important theories and concepts of environmental science, ecosystems, natural resources and conservation	u	9
4	Describe environmental hazards and risks and the social and economic ramifications	E	9
5	Familiarize with the major environmental problems its causes and potential solutions	u	9
6	Identify issues and problems relating to the humanrights.	u	9
7	Analyse country's situation or international situation in terms of	An	9
8	Create awareness on various environmental acts in India	c	9
9	Make the students aware of different issues and concerns related IT, Environment & Society	U	2,9,12
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Module 1: Multidisciplinary nature of environmental studies**	**18**	
1.1	Multidisciplinary nature of environmental studies Definition, scope and importance. Need for public awareness	2	3
1.2	**Natural Resources**: Renewable and non-renewable resources: Natural resources and associated problems.	1	1,3
1.2.1	**Forest resources**: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people	1	1
1.2.2	**Water resources**: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.	1	1
1.2.3	**Mineral resources**: Use and exploitation, environmental effects of extracting and using mineral resources, case studies	2	1
1.2.4	**Food resources**: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies	2	1
1.2.5	**Energy resources**: Growing energy needs, renewable and non renewable energy sources use of alternate energy sources, Case studies	1	1
1.2.6	**Land resources**: Land as a resource, land degradation, man induced landslides, soil erosion and desertification	1	1
1.2.7	Role of individual in conservation of natural resources. Equitable use of resources for sustainable life styles	1	2
1.3	**Ecosystems**- Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem	2	3
1.3.1	Ecological succession, food chains, food webs and ecological pyramids.	1	3
1.3.2	Introduction, types, characteristic features, structure and function of the given ecosystem- Forest ecosystem, grassland, desert	2	3
1.3.3	Aquatic ecosystem ponds, streams, lakes, rivers, oceans, estuaries.	1	3
2.0	**Module II: Biodiversity and its conservation**	**26**	**1,2,4**
2.1	Biodiversity and its conservation- Introduction, Definition: genetic, species and ecosystem diversity.	1	1,3
2.1.1	Biogeographical classification of India, Value of biodiversity: consumptive use, productive **use**, social, ethical, aesthetic and option values	1	1,3
2.1.3	Hot-spots of biodiversity	1	3
2.1.4	Threats to biodiversity: habitat loss, poaching of wildlife,	1	5

	man-wildlife conflicts. Endangered and endemic species of India.		
2.1.5	Conservation of biodiversity: In situ and Ex situ conservation of biodiversity	1	1,3
2.2	**ENVIRONMENTAL POLLUTION AND SOCIAL ISSUES**	**18**	**4,5**
2.2.1	Pollution Introduction and types of pollution	1	4,5
2.2.2	Causes, effects and control measures of:- Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards and Municipal solid waste	3	4,5
2.2.3	Pollution case studies {Local and National}. Role of an individual in prevention of pollution.	2	4,5
2.2.4	Disaster management: floods, earthquake, cyclone and landslides.	2	4,5
2.2.5	Environmental ethics: Consumerism, sustainable development	1	2
2.2.6	Water conservation, rain water harvesting, watershed management: its problems and concerns. Ramsar sites in Kerala	2	5,2
2.2.7	Climate change, global warming	1	5
2.2.8	Acid rain, ozone layer depletion	1	5
2.2.9	Environment Protection Act (1986) Air (Prevention and Control of Pollution) Act (1981)	2	8
2.2.10	Water (Prevention and control of Pollution) Act (1974), Wildlife Protection Act (1972).	1	8
2.2.11	Forest Conservation Act(1980). Issues involved in enforcement of environmental legislation. Biodiversity Act (2002)	2	8
3.0	**Module III: Internet as a knowledge repository**	**15**	
3.1	Internet as a knowledge repository, academic search techniques	2	3
3.2	creating cyber presence	1	3
3.3	Academic websites	1	3
3.4	open access initiatives	2	3
3.5	opens access publishing models	2	3
3.6	Introduction to use of IT in teaching and learning - Educational software	2	3
3.7	Academic services–INFLIBNET	2	3
3.8	NPTEL	1	3
3.9	NICNET	1	3
3.10	BRNET	1	3

4.0	**Module IV: IT & Society**	**15**	
4.1	IT & Society- issues and concerns	2	3
4.2	digital divide, IT & development, the free software movement	2	3
4.3	IT industry: new opportunities and new threats, software piracy	1	3
4.4	cyber ethics, cyber crime, cyber threats cyber security, privacy issues	2	3
4.5	cyber laws, cyber addictions, information overload,	1	3
4.6	health issues- guide lines for proper usage of computers	2	3
4.7	Internet and mobile phones. e-wastes and green computing	1	3
4.8	impact of IT on language & culture-localization issues	2	3
4.9	Unicode- IT and regional languages	1	3
4.10	Green Computing Concept	1	3
5.0	**Human Rights**	**10**	**6,7**
5.1	An Introduction to Human Rights, Meaning, concept and development	2	7
5.2	Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights).	2	7
5.3	**Human Rights and United Nations** – contributions, main human rights related organs -UNESCO,UNICEF, WHO, ILO	2	7
5,4	Mechanisms for checking violations of Human rights, National human right commission	1	7
5.5	Declarations for women and children, universal declaration of human rights.	1	6,7
5.6	**Human Rights in India** – Fundamental rights and Indian Constitution, Rights for children and women ,Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities	2	6,7
	Visit to a local area to document environmental assets :community Initiatives in watershed management: Case study- Meenachil- Meenanthara- Kodur River re-linking Programme {Kottayam district)	5	

Text Books for Reference

Environmental Science

1. Clark. R.S. Marine Pollution, Clanderson Press Oxford.
2. Cunningham, W.P. Cooper, T.H. Gorhani, Hepworth. M.T {2001). Environmental Encyclopedia, Jaico Publ. House. Mumbai. 1196p.

3. Cormondy E.J {1985). Concepts of Ecology. Prentice Hall of India, New Delhi.
4. De A.K. Enviornmental Chemistry, Wiley Eastern Ltd.
5. Heywood.V.H, Watson. R.T {1995). Global Biodiversity Assessment, Cambridge University Press 1140p.
6. Jadhav.H ,Bhosale.V.M {1995). Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p
7. Kumar R {Ed). Environmental pollution and health hazards in India. Ashish Pub. House, New Delhi.
8. Mani M S {1974). Ecology and Biogeography of India, W Junk Distributors. The Hague.
9. Mekinney.M.L, Schock.R.M{1996).Environmental Science Systems and Solutions. Web enhanced edition 639p
10. Miller T.G. Jr, Environmental Science, Wadsworth Publishing Co.
11. Odum.E.P {1971). Fundamentals of Ecology. W.B. Saunders Co. USA 574p
12. Odum E.P (1983}. Basic ecology. Saunders college publishing, Philadelphia.
13. Rao.M.N ,Datta.A.K (1987}. Waste Water treatment Oxford and IBII Publication Co.Pvt.Ltd.345p
14. Sharma B.K (2001}. Environmental Chemistry. Geol Publ. House, Meerut.
15. Townsend *C,* Harper *J,* and Michael Begon. Essentials of Ecology, Blackwell Science
16. Trivedi R.K. Handbook of Environmental Laws, Rules Guidelines, Compliances And Standards, Vol I and *II,* Enviro Media
17. Trivedi R. K,P.K. Goel. Introduction to air pollution, Techno-Science Publication
18. Wanger K.D (1998}. Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p

Human Rights

1. Amartya Sen (2009}. The Idea Justice, New Delhi: Penguin Books, 2009.

2. Chatrath, K. J.S (ed.}(1998}. Education for Human Rights and Democracy (Shimla: Indian Institute of Advanced Studies.

3. Law Relating to Human Rights (2001}. Asia Law House.

4. Shireesh Pal Singh, Human Rights Education in 21st Century, Discovery Publishing House Pvt. Ltd, New Delhi,

5. Khanna,S.K. (1998} and(2011}.Children andthe Human Rights, Common Wealth Publishers

6. Sudhir Kapoor (2001}. Human Rights in 21st Century, Mangal Deep Publications, Jaipur.

7. United Nations Development Programme (2004}. Human Development Report Cultural Liberty in Today's Diverse World, New Delhi: Oxford University Press, 2004.

Text Books

1. Odum. E.P (1971}. Fundamentals of Ecology. W.B. Saunders Co. USA 574p
2. Shireesh Pal Singh, Human Rights Education in 21st Century, Discovery
3. Publishing House Pvt. Ltd, New Delhi,
4. Chatrath, K. J.S (1998} Education for Human Rights and Democracy

Course	Details				
Code	**CA1815116**				
Title	**Java Programming using Linux**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Fifth Semester**				
Type	**Core**				
Credits	**3**	Hrs/Week	3 hours	Total Hours	54

CO No.	*Expected Course Outcomes* *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	**Understand platform independent pure object oriented programming paradigm through Java**	**U**	**3,4**
2	**Understand the concepts of packages, multithreading and exception handling for effective programming**	**U**	**3,4**
3	**Apply GUI components in event handling for user friendly program interface**	**Ap**	**3,4**
4	**Use applets in Java for internet programming**	**Ap**	**3,4**
5	**Obtain back-end connectivity using JDBC in Java programming**	**Ap**	**3,4**
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Object oriented programming - Concepts**	**10**	
1.1	Concepts of Object oriented programming, Benefits of OOP	2	1
1.2	Features of java	1	1
1.3	Java environment	2	1
1.4	Java tokens, Constant, variables, data types, operators	2	1
1.5	Control Statements-branching statements, looping statements	2	1
1.6	Jump statements, labeled loops	1	1
2.0	**Classes and Objects**	**10**	
2.1	Defining a Class, Fields declaration, Method declaration	1	1
2.2	Creating object, Accessing class members	1	1
2.3	Method overloading, Constructors, constructor overloading	1	1

2.4	Super keyword, static Members	1	1
2.5	Inheritance, overriding methods	3	1
2.6	Dynamic method dispatch, final(variables, methods and classes)	1	1
2.7	Abstract methods and classes, interfaces, visibility control	2	1
3.0	**Arrays, Packages, Exception Handling**	**12**	
3.1	One dimensional arrays, declaration, creation, initialization of arrays	1	2
3.2	two dimensional arrays	1	2
3.3	String class	1	2
3.4	Packages: - java API packages overview (lang, util, io, awt, swing, applet)	1	2
3.5	User defined packages-creating packages, using packages	2	2
3.6	Exception Handling Techniques-try-catch-throw-throws-finally	3	2
3.7	Multithreading	1	2
3.8	Creation of multithreaded program-Thread class-Runnable interface, Thread life cycle	2	2
4.0	**Event Handling**	**10**	
4.1	Delegation Event Model-Event Classes	1	3
4.2	Sources of Events-Event Listeners- Event classes	2	3
4.3	Swing- architecture	1	3
4.4	Components of swing- JLabel, JButton, JCheckBox, JRadioButton, JList, JComboBox, JTextField, JText Area, JPanel, JFrame	2	3
4.5	Layout Managers(Flow Layout, Grid Layout, Card Layout, Border Layout, Box Layout, Null Layout)	4	3
5.0	**Applet**	**10**	
5.1	Applet Fundamentals	1	4
5.2	Applet tag, applet life cycle	2	4
5.3	Passing parameters to applets	2	4
5.4	Working with graphics -Line, Rectangle, Oval, Arc, color setting	2	4
5.5	JDBC architecture- JDBC connection, JDBCstatement object	2	5
5.6	JDBC drivers	1	5

Text Books for Reference

1. E. Balagurusamy- Programming with Java , Third Edition, McGraw Hill Companies.

2. K. Somasundaram - PROGRAMMING IN JAVA2, First Edition, Jaico Publishing House.

Text Books for Enrichment

1. Patrick Naughton - Java2 The Complete Reference, Seventh Edition:
2. Cay S Horstmann & Gary Cornell - Core Java Volume 1- Fundamentals, Eighth edition.
3. Java 6 Programming Black Book 2007 Edition, Dreamtech press.

Course	Details				
Code	**CA1815401**				
Title	**Computer Fundamentals, Internet & MS Office**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Fifth Semester**				
Type	**OPEN COURSE**				
Credits	**3**	Hrs/Week	4 hours	Total Hours	72

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Describe the Fundamentals and Classifications of computers.	U	1
2	Explain the working of internet	U	2,12
3	Outline the salient features of word processing with special reference to Microsoft Word	U	2
4	Discuss the main features and application of Spread Sheet emphasizing Microsoft Excel	U	2
5	Describe the features of Microsoft PowerPoint	U	2
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Computer Fundamentals**	**12**	
1.1	History	2	1
1.2	Generations	2	1
1.3	Classifications	3	1
1.4	Operating Systems	3	1
1.5	Types of Networks	2	1
2.0	**The Internet**	**12**	
2.1	TCP/IP	2	2
2.2	IP Addressing	2	2
2.3	Client Server Communication	1	2
2.4	Intranet	1	2
2.5	WWW	1	2
2.6	Web Browser	1	2
2.7	Web Server	1	2

2.8	Hyperlinks	1	2
2.9	URLs	1	2
2.10	Electronic Email	1	2
3.0	**Word processing**	**14**	
3.1	Introduction	1	3
3.1	Microsoft Word	5	3
3.2	Basic Menus	2	3
3.3	Formatting the text & paragraph	3	3
3.4	Working with Index	3	3
4.0	**Spread Sheet**	**18**	
4.1	Introduction	1	4
4.2	Microsoft Excel	4	4
4.3	Basic Menus	4	4
4.4	Formulas	3	4
4.5	Basic functions	3	4
4.6	Charts and Graphs	3	4
5.0	**Microsoft PowerPoint**	**16**	
5.1	Introduction	1	5
5.2	Basic Menus	3	5
5.3	Template	3	5
5.4	Slide Basics	3	5
5.5	Charts	3	5
5.6	Adding Multimedia &Animation	3	5

Course	Details				
Code	**CA1815605**				
Title	**Software Lab V**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Fifth Semester**				
Type	**Core Practical**				
Credits	**2**	Hrs/Week	5 hours	Total Hours	90

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Write Java Applet programmes for different problems		
2	Apply the JDBC interface for connecting Java programs with SQL-based databases	Ap	2,4,10
3	Use the Overloading and Overriding methods in developing applications	Ap	2,4,10
4	Develop Programs using class and inputs from keyboard	Ap	2,4,10
5	Familiarize Interface implementation programs	Ap	2,4,10
6	Familiarize Programs through inheritance	Ap	2,4,10
7	Develop Programs using packages	Ap	2,4,10

Module	Course Description	Hrs	CO.No.
1.0	**PART I : Applet, JDBC connection and swing based Programs**	**34**	
1.1	Applet related programs	15	1
1.2	Programs using JDBC connection	9	2
1.3	Swing based Programs	10	2
2.0	**PART II : Using class and read inputs from keyboard**	**56**	
2.1.0	**Method Overloading- Method Overriding**		
2.1.1	Method overloading programs	6	3
2.1.2	Method overriding programs	6	3
2.2.0	**Multithreading - Exception Handling**		
2.2.1	Programs using class and inputs from keyboard	6	4
2.2.2	Programs based on Multithreading	6	4
2.2.3	Exception handling programs	4	4
2.3.0	**Abstract class, interfaces, inheritance, packages**		

2.3.1	Programs based on abstract class	4	5
2.3.1	Interface implementation programs	6	6
2.3.2	Programs through inheritance	10	7
2.3.3	Programs using packages	8	7

Scheme of Evaluation for Software Lab V external is as follows:

(There will be two questions; the first from Part I and second from Part II)

Division of Marks (Practical - 3 hours External)

First program - questions from Part I **- 25 marks**

1. Logic – 10 marks
2. Successful compilation – 8 marks
3. Result – 7 marks

Second program – questions from Part II **- 35 marks**

1. Logic – 20 marks
2. Successful compilation –10 marks
3. Result – 5 marks

Viva Voce **- 10 marks**

Lab Record **- 10 marks**

(Minimum of 25 Programs)

Total Marks - 80

Course	Details				
Code	**CA1815801**				
Title	**Software Development Lab –I (mini Project)**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Fifth Semester**				
Type	**Project Work**				
Credits	**2**	Hrs/Week	6 hours	Total Hours	108

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Acquire practical knowledge within the chosen area of technology for project development	An	2,3,4,6,10
2	Understand the problems faced during project implementation.	U	2,3,4,6,10
3	Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach	An	2,3,4,6,10
4	Contribute as an individual or in a team in development of technical projects	C	2,3,4,6,10
5	Develop effective communication skills for presentation of project related activities	C	2,3,4,6,10
6	Enhance the problem solving ability by solving the real-time problems.	C	2,3,4,6,10
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Mini Ptoject**	108	
1.1	Mini project can be a small complete application project, to make the student confident in designing a system based on Software engineering course. The internal and external evaluation is to be done with the project demonstration and presentation, viva and modification. It must be done in the college lab under the guidance of a faculty.	108	1-6

Scheme of Evaluation for Software Development Lab I external is as follows:

Division of Marks (Software Development Lab I)

Project demonstration and Presentation	**- 25 marks**
Modification	**- 15 marks**
Viva Voce	**- 15 marks**
Project report with proper content and binding	**- 25 marks**
Total Marks	**- 80 marks**

SEMESTER VI

Course Code	Title of the Course	Course Category	Hours/ week	Credits
CA1815117	Cloud Computing	Core 17	4	4
CA1815118	Mobile Application development- Android	Core 18	4	4
CA1816606	Software Lab VI & Seminar	Core Practical 6	6	2
CA1816802	Software Development Lab II (Main Project)	Project work 2	7	3
CA1815301	Data Mining	Elective	4	4
CA1816901	Viva Voce	Viva	-	1
		Total	**25**	**18**

Course	Details				
Code	**CA1815117**				
Title	**Cloud Computing**				
Degree	**BCA**				
Branch(s)	**Computer Scince**				
Year/Semester	**Sixth Semester**				
Type	**Core**				
Credits	**4**	Hrs/Week	4 hours	Total Hours	72

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Describe fundamental concepts of cloud computing	U	1,2,5,6,8
2	Distinguish parallel and distributed computing	U	1,2,5,6,8
3	Describe virtualization	U	1,2,5,6,8
4	Explain cloud computing architecture	U	1,2,5,6,8
5	Describe Cloud Application Platform – Aneka	U	1,2,5,6,8
6	Explain how cloud computing technologies are used to integrate and extend existing industrial applications.	U	1,2,5,6,8
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Introduction**	**14**	
1.1	Introduction	1	1
1.1	Cloud Computing at a Glance	2	1
1.2	Historical Developments	1	1
1.3	Building Cloud Computing Environments	2	1
1.4	Computing Platforms and Technologies	1	1
1.5	Principles of Parallel and Distributed Computing	2	2
1.6	Eras of Computing	1	2
1.7	Parallel vs. Distributed Computing	2	2
1.8	Elements of Parallel Computing	1	2
1.9	Elements ofDistributed Computing	1	2
2.0	**Virtualization**	**14**	
2.1	Introduction	3	3
2.2	Virtualization and Cloud Computing	4	3

2.3	Pros and Cons of Virtualization	3	3
2.4	Technology Examples	4	3
3.0	**Cloud Computing Architecture**	**`14**	
3.1	Introduction	2	4
3.2	Cloud Reference Model	4	4
3.3	Types of Clouds	4	4
3.4	Economics of the Cloud	2	4
3.5	Open Challenges	2	4
4.0	**Aneka - Cloud Application Platform**	**16**	
4.1	Introduction	1	5
4.2	Framework Overview	2	5
4.3	Anatomy of the Aneka Container	2	5
4.4	Building Aneka Clouds	2	5
4.5	Cloud Programming and Management	2	5
4.6	Data Intensive Computing: Map-ReduceProgramming	2	5
4.7	What is Data-Intensive Computing?	1	5
4.8	Technologies for Data-Intensive Computing	2	5
4.9	AnekaMap Reduce Programming	2	5
5.0	**Cloud Platforms in Industry**	**14**	
5.1	Amazon Web Services	3	6
5.2	Google AppEngine	3	6
5.3	Microsoft Azure	2	6
5.4	Cloud Applications: Scientific Applications	3	6
5.5	Cloud Applications :Business and Consumer Applications	3	6

Text Books for Reference

1. RajkumarBuyya, Christian Vecchiola,ThamaraiSelvi- Mastering Cloud Computing, Tata McGraw Hill Publications.

Text Books for Enrichment

2. Kumar Saurabha, “Cloud Computing “Wiley Publication Krutz,Vines “Cloud Security”. Wiley Publication.

3. A Srinivasan& J. Suresh “Cloud Computing : A Practical Approach for learning Implementation “, First edition, Pearson

Course	Details				
Code	**CA1815118**				
Title	**Mobile Application Development – Android**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Sixth Semester**				
Type	**Core**				
Credits	**4**	Hrs/Week	4 hours	Total Hours	72

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Understand the concepts of Android platform and thereby Android Virtual Devices.	U	2,3,4,7,8,10
2	Explain how User Interfaceis designed using different tools	U	2,3,4,7,8,10
3	Understand the Android Activity Life Cycle and its applications	R	2,3,4,7,8,10
4	Describe the multimedia using the combination of interactive content-Audio, Video and Text.	U	2,3,4,7,8,10
5	Understand creation, connection and manipulation of SQLite database in android	R	2,3,4,7,8,10
6	Explain XML and JSON, both of which are commonly used with API to pass data back and forth between software programs	U	2,3,4,7,8,10
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Introduction**	**10**	
1.1	Introduction to Android	1	1
1.2	Android Versions	1	1
1.3	Android Activity	1	1
1.4	Android Features and Architecture	1	1
1.5	Java JDK, Android SDK,	1	1
1.6	Android Development Tools	1	1
1.7	Android Virtual Devices	1	1
1.8	Emulators, Dalvik Virtual Machine	1	1
1.9	Layouts – Linear, Absolute	1	1

1.10	Frame, Relative and Table.	1	1
2.0	**Android User Interface**	**16**	
2.1	Fundamental UI design	1	2
2.2	User interface with View	1	2
2.3	Text View	1	2
2.4	Buttons, Image Button.	1	2
2.5	Edit Text	1	2
2.6	Check Box	1	2
2.7	Toggle Button	1	2
2.8	Radio Button	1	2
2.9	Radio Group	1	2
2.10	Progress Bar	1	2
2.11	Autocomplete Text View.	1	2
2.12	Spinner, List View.	1	2
2.13	Grid View, Image View	1	2
2.14	Scroll View	1	2
2.15	Custom Toast Alert.	1	2
2.16	Time and Date Picker.	1	2
3.0	**Activity**	**14**	
3.1	Introduction	2	2
3.2	Intent	1	2
3.3	Intent_filter	1	2
3.4	Activity Life Cycle	2	3
3.5	Broadcast Life Cycle	2	3
3.6	Services	1	3
3.7	Multimedia-Android System Architecture	2	4
3.8	Play Audio	1	4
3.9	Play Video	1	4
3.10	Text to speech	1	4
4.0	**SQLite Database in Android**	**16**	
4.1	Introduction to SQLite Database	2	5
4.2	Creation and Connection of the Database	4	5
4.3	Extracting values from Cursors	2	5
4.4	Transactions	2	5
4.5	Telephoning and Messaging-SMS Telephony	2	3
4.6	Sending SMS	1	3
4.7	Receiving SMS	1	3
4.8	Wi-Fi Activity	2	3
5.0	**Introduction to JSON and XML**	**16**	

5.1	Introduction	2	6
5.2	Use of JSON	1	6
5.3	Syntax and Rule of JSON	2	6
5.4	JSON Name	1	6
5.5	JSON Values	1	6
5.6	JSON Objects	1	6
5.7	JSON Arrays	2	6
5.8	Parsing JSON	1	6
5.9	Parsing XML.	1	6
5.10	Google Play services	2	6
5.11	Location services	1	6
5.12	Maps.	1	6

Book of Study:

1. Prasanna Kumar Dixit - ANDROID, Vikas Publishing House.

2. AnubhavPradhan, Anil Deshpande, Composing Mobile Apps using Android, Wiley India Pvt.Ltd,2014

References

1. Kevin Grant and Chris Haseman, Beginning Android Programming – Develop and Design, Pearson.

Course	Details				
Code	**CA1815301**				
Title	**Data Mining**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Sixth Semester**				
Type	**Elective**				
Credits	**4**	Hrs/Week	4 hours	Total Hours	72

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Understand data warehousing and mining concepts	U	1,2,6,8
2	Evaluate different models used for OLAP, OLTP and data preprocessing	An	1,2,6,8
3	Categorize the situations for applying different data-mining techniques: frequent pattern mining, association, correlation, classification, prediction, and cluster and outlier analysis	Ap	1,2,6,8
4	Understand systems for data mining	U	1,2,6,8
5	Understand the performance of different data-mining algorithms	U	1,2,6,8
6	Propose data-mining solutions for different applications	An	1,2,6,8
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Introduction Data Mining,**	**12**	
1.1	Introduction	1	1
1.2	Data Ware House, Transactional Databases	1	1
1.3	Data Mining Functionalities Characterization and Discrimination	1	1
1.4	Mining frequent patterns	1	1
1.5	Association and correlation	1	1
1.6	Classification and Prediction	1	1
1.7	Cluster Analysis	1	1
1.8	Classification of Data Mining Systems, Data Mining Task Primitive	1	1
1.9	Integration of Data Mining systems, Major issues in	1	1

	Data Mining		
1.10	Data integration and transformation	1	1
1.11	Data reduction	1	1
1.12	Data discretization	1	1
2.0	**Data Warehouse**	**12**	
2.1	Data Warehouse	1	2
2.2	OLAP technology Data Warehouse	2	2
2.3	Multidimensional data Model	1	2
2.4	Data warehouse architecture	2	2
2.5	Data Warehouse implementation	2	2
2.6	OLAP.	1	2
2.7	Data Warehouse and data mining	3	2
3.0	**Association Rules and Classification Concepts Efficient**	**18**	
3.1	Introduction	1	3
3.2	Scalable Frequent item set Mining methods	2	3
3.3	Mining various kind of association rules	2	3
3.4	from association mining to Co-relation analysis	1	3
3.5	Classification and prediction	2	3
3.6	Classification and prediction -Issues	1	3
3.7	Classification by Decision tree induction	2	3
3.8	Bayesian Classification	1	3
3.9	Rule-based classification	1	3
3.10	Support Vector Machines	2	3
3.11	Learning from your neighbors	2	3
3.12	Prediction	1	3
4.0	**Cluster Analysis**	**18**	
4.1	Definition	1	4
4.2	Types of data in cluster analysis	3	4
4.3	A categorization major Clustering methods	3	4
4.4	Partitioning methods	2	4
4.5	K-means and k-medoids	2	5
4.6	from k-medoids to CLARANS	3	5
4.7	Hierarchical methods	2	5
4.8	Density based methods	2	5
5.0	**Mining Complex**	**12**	
5.1	Data Spatial Data Mining	5	6
5.2	Multimedia Data Mining, Text Mining	4	6
5.3	Mining WWW	3	6

Book of Study

1. Jiawei Han and MichelineKamber - Data Mining - Concepts and Techniques,Second Edition, Elsevier, 2006

References

1. Witten and Frank - Data Mining Practical Machine Learning Tools and Techniques, Second Edition, Elsevier, 2005
2. Soman, Divakar and Ajay, Data Mining Theory and Practice, PHI, 2006
3. Margaret H Dunham- Data Mining –Introductory and Advanced Topics, Fourth Edition, Person

Course	Details				
Code	**CA1816606**				
Title	**Software Lab VI & Seminar.**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Sixth Semester**				
Type	**Core Practical**				
Credits	**2**	Hrs/Week	6 hours	Total Hours	108

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Expose to a wide range of topics in computer science	U	2,3,4,7,8,10,12
2	Produce the documents related to the selected topic	Ap	2,3,4,7,8,10,12
3	Able to participate in discussions and to get feedback about the presented material.	An	2,3,4,7,8,10,12
4	Identify the sources of and utilize subject content of literature in the computer profession	An	2,3,4,7,8,10,12
5	Utilize the literature in the computer profession to formulate and produce summaries of a topic within the literature	An	2,3,4,7,8,10,12
6	Able to Plan, develop, and deliver professional presentations using presentation tools such as Power Point.	C	2,3,4,7,8,10,12
7	Explain the differences between Android and other mobile development environments	U	2,3,4,7,8,10,12
8	Understand how Android applications work, their life cycle, manifest, Intents, and using external resources	U	2,3,4,7,8,10
9	Shows how to create an app interface	Ap	2,3,4,7,8,10
10	Learn to save data to a database is ideal for repeating or structured data, such as contact information.	U	2,3,4,7,8,10
11	Understand JSON a lightweight data-interchange format	U	2,3,4,7,8,10
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Seminar**	36	1-6
2.0	**Installation and configuration of Eclipse and Development Tools**	18	7,8
3.0	**Creating simple apps using Interface Tools**	18	9
4.0	**Creating Andoid Apps using SQLite**	18	10
5.0	**Familiarizing with JSON and XML, Creation and distribution of Android Apps.**	18	10

Course	Details				
Code	**CA1816802**				
Title	**Software Development Lab II(main Project)**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Sixth Semester**				
Type	**Project Work**				
Credits	**3**	Hrs/Week	7 hours	Total Hours	126

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Acquire practical knowledge within the chosen area of technology for project development	An	2,3,4,5,7,8,10,11,12
2	Understand the problems faced during project implementation.	U	2,3,4,5,7,8,10,11,12
3	Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach	An	2,3,4,5,7,8,10,11
4	Contribute as an individual or in a team in development of technical projects	C	2,3,4,5,7,8,10,11,12
5	Develop effective communication skills for presentation of project related activities	C	2,3,4,5,7,8,10,11,12
6	Enhance the problem solving ability by solving the real-time problems.	C	2,3,4,5,7,8,10,11
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Module	Course Description	Hrs	CO.No.
1.0	**Main Project**	**72**	**1-6**
	The project topic shall be chosen from areas of current day interest using latest packages / languages running on appropriate platforms (Except the tools used in software development-I), so that the student can be trained to meet the requirements of the Industry. A project report should be submitted in hard bound complete in all aspects. For internal evaluation, the progress of the student shall be systematically assessed through various stages of evaluation at periodic intervals		

Scheme of Evaluation for Software Development Lab II external is as follows:
Division of Marks (Software Development Lab II)

Project demonstration and Presentation **- 40 marks**
Viva related to project **- 20 marks**
Project report with proper content and binding **-20 marks**
Total Marks - 80marks

Course	Details				
Code	**CA1816901**				
Title	**VIVA VOCE**				
Degree	**BCA**				
Branch(s)	**Computer Science**				
Year/Semester	**Sixth Semester**				
Type	**Core Viva**				
Credits	**1**	Hrs/Week	-	Total Hours	-

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Evaluate how much learning outcomes have been met at the end of the UG programme.	U,Ap,E	1-12
2	Prepare for interviews both at the academic and the industrial sector.	U,Ap,An	8,11,12
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create			

Scheme of Evaluation of Viva voce (core) for External is as follows:

Each student should attend a course viva voce based on syllabus from semester I to semester IV.

Total Marks – 100 marks

ADD ON COURSE

Course	Details			
Code	**CA18A1001**			
Title	**Cyber Security**			
Degree	**BCA**			
Branch(s)	**Computer Science**			
Year/Semester	**Fourth semester**			
Type	**Add on**			
Credits	2			
Contact Hours	Total Hours	36	Hours/week	2

CO No.	*Expected Course Outcomes* *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Understand fundamental basic issues of Cyber security	R	1
2	Familiarise Cyber Security Vulnerabilities and Cyber Security Safeguards	U	1
3	Understand Securing Web Application, Services and Servers	U	1
4	Understand the aspects related to Intrusion Detection and Prevention	U	1

Module	Course Description	Hrs	CO.No.
1.0	**Introduction Introduction to Cyber Security**	6	
1.1	Overview of Cyber Security	1	1
1.2	Internet Governance – Challenges and Constraints	1	1
1.3	Cyber Threats: Cyber Warfare	1	1
1.4	Cyber Crime	1	1
1.5	Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority,	1	1
1.6	Need for an International convention on Cyberspace.	1	1
2.0	**Cyber Security Vulnerabilities and Cyber Security Safeguards**	**10**	
2.1	Cyber Security Vulnerabilities-Overview	1	2
2.2	vulnerabilities in software, System administration, Complex Network Architectures,	1	2
2.3	Open Access to Organizational Data Poor Cyber Security Awareness.	1	2

2.4	Weak Authentication	1	2
2.5	Unprotected Broadband communications,	1	2
2.6	Biometrics, Cryptography	1	2
2.7	Cyber Security Safeguards- Overview, Access control, Audit, Authentication,	1	2
2.8	Denial of Service Filters, Ethical Hacking, Firewalls	1	2
2.9	Intrusion Detection Systems, Response,	1	2
2.10	Scanning, Security policy, Threat Management	1	2
3.0	**Securing Web Application, Services and Servers**	**8**	
3.1	Introduction	1	3
3.2	Basic security for HTTP Applications	1	3
3.3	and Services Identity Management	1	3
3.4	Basic Security for SOAP Services	2	3
3.5	Authorization Patterns	1	3
3.6	Security Considerations	1	3
3.7	Challenges.	1	3
4.0	**Intrusion Detection and Prevention**	**12**	
4.1	Intrusion	1	4
4.2	Physical Theft, Abuse of Privileges	1	4
4.3	Unauthorized Access by Outsider	1	4
4.4	Network Session Analysis	1	4
4.5	Intrusion detection and Prevention Techniques	1	4
4.6	Anti-Malware software	1	4
4.7	Malware infection	1	4
4.8	Network based Intrusion detection Systems	2	4
4.9	Host based Intrusion prevention Systems	1	4
4.10	Security Information Management	1	4
4.11	System Integrity Validation.	1	4

Course	Details			
Code	**CA18A1002**			
Title	**Dot-Net Applications**			
Degree	**BCA**			
Branch(s)	**Computer Science**			
Year/Semester	**Fourth semester**			
Type	**Add on**			
Credits	2			
Contact Hours	Total Hours	36	Hours/week	2

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Understand fundamental concepts of dot-net technology	R	1
2	Use DATABASE along with web-applications	Ap	1
3	Apply the concept of Data Bindings With Web-Forms	Ap	1

Module	Course Description	Hrs	CO.No.
1.0	**Introduction to HTML,.Net & C#**	**12**	
1.1	Basic Tags	1	1
1.2	NET Framework structure, .NET IDE	1	1
1.3	List commonly used .NET Framework namespaces	1	1
1.4	CLR	1	1
1.5	NET Framework features	1	1
1.6	JIT,MSIL,FCL	1	1
1.7	C# Language Fundamentals	1	1
1.8	Control Flow Statements	1	2
1.9	Looping Statements	1	2
1.10	Introduction to C# Programming	1	2
1.11	Arrays	1	2
1.12	Inheritance	1	
2.0	**DATABASE**	**12**	
2.1	Introduction to SQL Server	1	3
2.2	SQL Basic Queries	1	3
2.3	Introduction to Asp.Net	2	3

2.4	Basic Server Controls	2	3
2.5	Advanced Controls	2	3
2.6	State Managements	2	3
2.7	ADO.Net(Database Connection)	2	3
3.0	**Data Bindings With Web Forms**	**12**	
3.1	Overview of **Data Binding**	1	4
3.2	Grid View Binding	1	4
3.3	Two Tier Architecture	1	4
3.4	Dropdown List Binding using Data Set	1	4
3.5	Populating Dropdown List	1	4
3.6	Bound Field	1	4
3.7	Template Field	1	4
3.8	Create a registration form and process:	1	4
3.9	Insert	1	4
3.10	Login Checking	1	4
3.11	Profile View	1	4
3.12	Grid View Binding	1	4

Course	Details			
Code	**CA18A1003**			
Title	**Programming with Python**			
Degree	**BCA**			
Branch(s)	**Computer Science**			
Year/Semester	**Fourth semester**			
Type	**Add on**			
Credits	2			
Contact Hours	Total Hours	36	Hours/week	2

CO No.	***Expected Course Outcomes*** *Upon completion of this course, the students will be able to*:	Cognitive Level	PSO No.
1	Understand fundamental concepts of Python	R	1,2
2	Apply the Expressive Language approach of Python Programming	Ap	1,2
3	Apply Object Oriented programming principles using Python	Ap	1,2,4,9
4	Demonstrate GUI programming	Ap	1,2,4,9

Module	Course Description	Hrs	CO.No.
1.0	**Overview**	**15**	
1.1	Environment	1	1
1.2	Basic Syntax	1	1
1.3	Variable types	1	1
1.4	Basic Operators	1	1
1.5	NET Framework features	1	1
1.6	Installing Python	1	1
1.7	Very simple Programs	1	1
1.8	Scripts Loops	1	2
1.9	Conditional functions	1	2
1.10	Tuples	1	2
1.11	Lists	1	2
1.12	Dictionaries for loop	1	2
1.13	Classes	1	2
1.14	Importing modules	1	2
1.15	File I/O Error Handling	1	2
2.0	**Structures**	**21**	
2.1	If .. else	1	3
2.2	While loop	1	3

2.3	For loop	1	3
2.4	Loop control	1	3
2.5	Numbers, Strings,Lists	2	3
2.6	Tuples	2	3
2.7	Dictionary	2	3
2.8	Date and Time	1	3
2.9	Functions	1	3
2.10	Modules	1	3
2.11	Files I/O	1	3
2.12	Exceptions	2	3
1.13	Classes/Objects	2	3
2.14	Reg Expressions	1	3
2.15	GUI Programming	2	4

Reference Book

1. *Dr. John* M. *Zelle, Franklin, Beedle & Associates Inc.,* **Python Programming: An Introduction to Computer Science.**
2. Allen B. Downey, *Green Tea Press,* **Think Python**